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T R E A T I S E  
O N  
T H E A T R E S.

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BY GEORGE SAUNDERS.

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MDCXC.



TO THE

RIGHT HONOURABLE

CHARLES· FRANCIS GREVILLE,

THE FOLLOWING TREATISE IS

WITH ALL RESPECT

INSCRIBED,

AS AN HUMBLE TRIBUTE TO THE DISTINGUISHED VIRTUES OF AN

AMIALE AND ACCOMPLISHED CHARACTER,

BY HIS MOST DUTIFUL

AND DEVOTED SERVANT,

GEORGE SAUNDERS.



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## INTRODUCTION.

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THE following Treatise is offered to the publick, principally with a view to forward an inquiry into the essentials of a good theatre—an inquiry which seems at this time peculiarly worthy of attention, when projects are forming for the erection of two new ones in this city. And this circumstance, it is hoped, will sufficiently apologize for producing an arrangement rather hastily drawn up of deliberate and attentive observations on the principal theatres of Europe.

Our theatres have been held in so small estimation, that authors in general, who have either written, or only made occasional mention, of those in other places, have passed over these as unworthy of notice.

When a foreigner arrives at a town, his curiosity naturally leads him in the first place to visit the theatre. Here he receives his first impressions of the state of the arts, of the genius and the manners of the people. To avoid the imputation of bad taste, and to attain our own advantage and accommodation, it behoves us to be attentive to the principles of constructing a theatre, the consideration of which being

once taken up by the men of science in this country, would ensure us not only a good theatre, but, I will venture to say, one superior to any at present existing.

The most splendid theatres have been raised through the munificence of princes; and it is almost impossible, that any thing of the kind can be produced on a large, or elegant scale, when confined to the interest or the capital of adventurers. If we expect to have a magnificent building, we must join in a liberal contribution for effecting it; in return for which, besides the honour and satisfaction of having so done, the subscribers should have a certain number of the principal boxes allotted to them, and their families. This is the case at Milan, where a small additional sum is paid by each spectator at the time of entrance. We should also be very careful not to load the manager with a heavy rent; of the opera in particular, where the salaries of performers, expence of decoration, and attendance, are so great, as necessarily to deter him from producing such a display of elegance, as might otherwise be attained.

Hitherto theatres have been erected at hazard. No certain rule has been found, whereby an architect might proceed; in consequence of which, we find a different form in almost every theatre, and as many different opinions as there are persons who have written or spoken on the subject; some pretending that this or that form was best, without assigning any reasons; whilst others, indifferent to the form or to the essential qualities of the theatre, have confined their observations to its materials, decorations, &c.

Count Algarotti is the first of the moderns, that has written any thing of consequence respecting the theatre. In 1762 he published his *Essay* on the Opera, wherein he makes some very judicious remarks on the construction of a theatre; but by not giving a design, has left it to the ingenuity of the architect to obviate the faults he mentions, and to combine the advantages.

After Algarotti's, a great number of publications appeared, which in general contain little more than arguments in favour of their different models.

But in 1781 Monsr. Noverre published, at Amsterdam, "*Observations sur la Construction d'une nouvelle Salle de l'Opera.*" This work contains, besides many judicious remarks on the theatre in general, the many practical observations Monsr. Noverre was enabled to make, as ballet-master, at different times, throughout Europe. He has exposed the faults of stages in general, and pointed out their remedies; and these faults are inseparable from every present edifice of that kind\*. Upon the whole, we are much indebted to Mr. Noverre, for the lights he has thrown upon this difficult part of the theatre.

In 1782 appeared an *Essay on Theatrical Architecture*, by Monsr. Patte; which pleased me much, as he was the first who attempted to lay down some principle on which to proceed. His theory, however, in my opinion is deficient, his examination of theatres is partial, and sometimes his comparisons are unfair.

\* "J'ai vu tous les théâtres de l'Italie, de l'Allemagne, de l'Angleterre & de la France. De cette quantité d'édifices, je n'en connois pas un dont les défauts ne surpassent les beautés."



## INTRODUCTION.

But how was it possible to draw any just conclusions respecting theatres, whilst the progress of sound remained so little ascertained? In designing a theatre, the first question that naturally arises is, In what form does the voice expand? To me it is matter of surprise, that so simple a question should not have yet engaged a serious examination. We have many considerable tracts on the propagation, refraction and reflection of sound, but on the last two of these subjects very inconclusive.

It has often been remarked, by natives as well as foreigners, that the disposition of our theatres\* was inimical to a beautiful form. To surmount this difficulty has been my endeavour; and I flatter myself, that far from being inimical to such a form, I shall shew that our arrangement is compatible with one in itself beautiful and most analogous to the good examples of the antique.

The method I practised was, regardless of any theory, to make my observations in the different parts of a theatre. About ten weeks since, finding no plan was decided upon, either for Theatre or Opera, I began some experiments on the voice, and comparing the result of them with the observations I had before made, I drew the conclusions which are now offered to the public.

The shortness of the time I have been engaged in this work, together with the interference of other occupations, will I hope plead an excuse for such deficiencies as may appear in the following Treatise.

\* Three galleries, *i. e.* boxes and two galleries above.

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## C H A P.

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*To the Binder.*

Place the thirteen plates at the end.

As the names of different parts of the theatre are very unfixed in the English language, it may be thought necessary to compare such of them as are made use of in this book with those of other languages.

<i>Latin</i>	<i>Italian</i>	<i>English</i>	<i>French</i>
Theatrum	Teatro	Theatre	Salle
Orchestra	Platea	Pit	Parquet ou Parterre
- - -	Orchestra	Orchestre	Orchestre
- - -	Loggia	Box	Loge
- - -	- - -	Balcony	Amphithéâtre ou Balcon
- - -	- - -	Frontispiece	Avant-scène
Hyposcenium	- - -	Frontispiece below stage-floor	- - -
Scena	- - -	Stage	Théâtre
Pulpitum vel Logeum Palco		Stage-floor	- - -
Scena	Scena	Scene	Scène
Parascenia	Telai	Side scenes	Châssis
Proscenium	- - -	Open space before the scene	- - -
Postscenium	- - -	Parts behind the scene	- - -



A<sup>.</sup>

T R E A T I S E

O N

T H E A T R E S.

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CHAPTER I.

*Optics and Phonics considered as they relate to Theatres.*

**O**PTICS, in the extensive acceptation of the word, include a considerable part of the science of mixed mathematics; our enquiry will be confined to that part which relates to direct vision.

It is an universal custom to take the point of sight for the scene painting, at the centre of the front boxes; and this, not only for the flats or end scene, but for the side scenes also, in which it is necessary in many instances to represent one continued line, such as the side of a room, &c. in which case, the least remove from the centre breaks this line, and weakens the effect of the scene. This demonstrates that our

B

Painted

### Optics and Phonics considered.

Painted scenes can be viewed to a proper advantage in one situation only; and that they will appear defective, in proportion as they are viewed at a distance from this point.

The actor is the only object, that can determine the form for viewing: whatever the scene may be, he will constantly attract our attention. Therefore, supposing his situation to be the centre of the stage front, it follows that this is the point, to which the eyes of all the spectators are directed. The only line, from which the rays are direct, is the semicircle, fig. 1, pl. 1, whose centre is the spot where the actor is situated as at A.

It has often been observed, that if we view a person at a greater height than an angle of 45 degrees (fig. 2, pl. 1), the features appear distorted and the expressions grimace. To discern well the motions of the features, we cannot be too near the actor: it is with great difficulty we comprehend them, at the distance of 75 feet.

*Phonics* or the doctrine of sounds is particularly distinguished from *Acoustics* or the doctrine of hearing. Instead of dividing it into direct, refracted, and reflected, I shall, for the sake of brevity and perspicuity, divide Phonics into three distinct heads; namely, *formation of sound*, *combination of sounds*, and *progress of sound*. I shall pass over the first two, except where their intimate connection with the latter renders some mention of them unavoidable.

Sound is transmitted and makes its progress through the medium of air. The manner of its operating on the air has long been the cause of much curious enquiry; the result of which goes no farther than to suppose

### *Optics and Phonics considered.*

suppose it is affected by vibration, and moves in a circular undulating form, somewhat similar to that of water, when a stone is thrown into it. It is well known, that if the formation of the sound be fixed, as in the instance of a bell when struck, it will expand equally every way, if nothing intervenes to alter its course, and the air in the sphere of its extent be of equal density.

But as sound is very much influenced or altered by the bodies it meets with, and the form of its expansion depends much on the manner of its being transmitted, it is necessarily our business to enquire, how it is affected by the different bodies it may meet with in its progress, and more particularly, of the manner in which the human voice expands. In examining what has already been written upon these subjects, very little could be gained to our purpose; and this occasioned the following experiments, which may help to give to this part of science an additional degree of certainty.



## *Experiments on the Voice.*

### CHAPTER II.

#### *Experiments on the Voice.*

**I**N making the following experiments my sole point of enquiry was the progress of sound, particularly of the human voice; how it is affected in the medium through which it passes; what aids, and what impedes it.

#### PROPOSITION I.

##### *Of the Extension of the Voice on a Plane.*

**EXP. I.** Having traced a circle of 100 feet in diameter, I placed the speaker in the centre\*; the distance, therefore, was the radius of 50 feet every way, as fig. 3, pl. 1. The hearer moving on the circumference of this circle heard most distinctly when in front of the speaker, not much less so on each side, but scarce at all behind.

**EXP. 2.** In the same circle, I placed the speaker at 25 feet from the centre, which was 3-4ths of the diameter or 75 feet to the front, and

\* In all the following experiments, a calm day was chosen for the purpose, and an open place; the positions of speaker and hearer were alternately changed, and the notes made by each compared. A book was made use of for this purpose, as the voice was less liable to be altered by reading.

### *Experiments on the Voice.*

25 feet behind. He was heard best at the sides C C, and indifferent in front and behind.

EXP. 3. On repeating these experiments, and changing the situation of the speaker, I found the voice reached the circumference most equally when he was placed at 17 feet from the centre. I then, without regarding the circle, traced the extreme distance at which the voice could be distinctly heard every way\*. The line it formed was that described by fig. 4, pl. I; the situation of the speaker was at A, from which point, at the distance of 17 feet in front, B will be the centre to part of the circle which it formed: the extent from speaker to hearer will be 92 feet in front, 75 feet on each side, and 31 feet behind.

The difference of the form made by the voice, and that made by fixed sound, is evidently occasioned by the voice's being pushed forward from the mouth; and this difference will always be in proportion to the exertion of the speaker, and subject to very little variation.

### P R O P. II.

#### *Of the Ascension, Descension, and cubical Form of Sound.*

I FOUND some difficulty in ascertaining this: for in all the first opportunities which offered for trying it, the descension of the voice always

\* I always found the best way of comparing the difference of extension was by taking the extreme distance at which the voice could be distinctly heard.

exceeded.

### *Experiments on the Voice.*

exceeded the ascension so much, as seemed almost improbable \*. These experiments were tried upon poles, ladders, or high buildings.

EXP. 1. In a clean chimney, almost straight, the voice ascended 50 feet, and descended 60 feet; was heard equally well as at the distance of 70 feet on a plane: but as the floor of the room, as well as the earth, in the other instances, might attract the sound downwards †, I made another experiment in St. Paul's Cathedral.

EXP. 2. The well-hole of the stair-case, which is free of any redundancy of sound, is about 8 feet in diameter, encircled by a stone wall, and covered with a sky-light. At some distance from the bottom, and near the top, were alternately placed speaker and hearer; when the voice descending was heard at the distance of 80 feet, ascending, 70 feet.

..Allowing for the difference of the air's density at the top, and bottom, we may reasonably conclude that could an air be found, of the same medium throughout, sound would expand equally every way, and form a *perfect sphere*; in confirmation of which I can add the trial made in a very windy, cold day, at a considerable height, the lowest person being at some distance from the ground; when the ascension and descension were scarcely different, and both corresponded with the distance on a plane.

\* It has been commonly believed, to ascend, more than descend, which at all events is contrary to its principle.

† I was obliged to Dr. Burney for this hint, who very kindly gave me any information I required.

## *Experiments on the Voice.*

### P R O P. III.

*Does the Voice act upon a certain Quantity of Air of whatever Form to which it may be confined?*

DECIDEDLY not; for in all the trials I have made in long narrow rooms or passages, the proper distance for distinct hearing was nearly the same as in large square rooms.

This must not be supposed to allude to long narrow tubes, which having a small bore proportioned to the volley of air issuing from the lungs, through the mouth, will be equally affected at the end, by the displacing of so much air.

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### P R O P. IV.

*Of Screens partially placed before the Voice, and opposing Angles.*

EXP. I. In an open field, which had in the middle a garden-seat enclosed with boards, as fig. 5, pl. 1, the speaker was placed at the spot marked A, the hearer at the distance of 60 feet; no difference was perceived by the hearer till arriving at B he began to lose sight of A, by the interception of the angle of the garden-seat. From B to F, is described the line traced, wherein the speaker might be heard, and which, at the shortest distance, was not more than 15 feet\*.

\* These experiments as well as most others were made with the hearer's eyes shut to prevent his being influenced by seeing the motion of the mouth.

EXP.

### *Experiments on the Voice.*

EXP. 2. The speaker was then placed at C, and the hearer at D; he was heard distinctly at the distance of 60 feet; better near the boards than at a distance from them: but when the hearer was placed at A, and the speaker advanced from C towards D, he could not be heard till he arrived at E, which was about 20 feet distant.

These and many other examinations are evident proofs of the delicate nature of the voice, and of the trifling circumstances that will check it in its progress: it is clear, that it requires a direct free passage. The lightness of air and gentle impussions occasioned by the voice, will account for its not getting readily round any obstacle; the time necessary for its arrival gives opportunity for its being destroyed.

### P R O P. V.

*How Sound operates in different Airs, and how much it is affected by  
Currents of Air.*

EXP. In two stacks of chimneys of the same form and height, and nearly straight; one to the north, always without fire; the other to the south, with constant fires; the voice was heard with fire at the distance of 40 feet upwards, and 50 feet downwards; without fire 50 feet upwards, and 60 feet downwards;—equal to 70 feet on a plane.

This agrees with Dr. Priestley's observation, that sound varies only in proportion

proportion to the density of air \* ; or that the more dense is the air, the more it favours sound.

In the foregoing experiment, sound was heard downwards one-fifth farther than upwards, although in descending, it went against the *current*, occasioned by a very strong fire. The same observations I have repeatedly made on very windy days, when I found no sensible difference, with or against the wind.

The reason is obvious. From the shortness of the distance to which the voice extends, the mass of air is so instantaneously affected, as not to give time for a perceptible operation of the *current* † : on the contrary, great sounds, which move a large body of air, are capable of being carried to a considerable distance by the wind, which may be observed in the firing of cannons, ringing of church bells, &c. where it is known to make a difference of some miles.

\* “ The result of all my observations, as far as I could judge, was that the intensity of sound depends solely upon the density of the air in which it is made, and not at all upon any chemical principle in its constitution.” Dr. Priestley’s Exp. on Natural Philosophy, vol. ii. page 298.

• † Dr. Derham proved that sound moves 1142 feet in a second.

## P R O P. VI.

*Of the Reflection of Sound.*

THE supposition of sound's *reflecting* has been almost universally admitted. The echo was accounted to be the effect of *reflection*, and has occasioned many laborious tracts to be written, explaining the manner of its operating, and the forms that would produce it.

Sound is defined to be "the effect of a collision of bodies, and a tremulous motion consequent thereon, communicated thence to the circumambient fluid, and propagated through it to the organs of hearing."

"To explain this, all sensible bodies are supposed to consist of a number of small and insensible parts, or corpuscles, which are of the same nature in all bodies, and are perfectly hard, and incompressible.

"To apply this theory; strike a bell with any hard body, and you easily perceive a sensible tremor in the surface, spreading itself over the whole, and that more sensibly as the shock is greater. Upon touching it in any other part, the motion and the sound too are stopped. Now this is apparently a motion of the small and insensible parts, changing their situations with respect to one another; which being so many, and so closely united, we cannot perceive their motions separately and distinctly; but only a trembling, which we reckon to be the effect of the confusion of an infinite number of little particles, closely joined, and moving in infinitely little lines.

"The

“ The sonorous body having made its impression on the contiguous air, that impression is propagated from one particle to another, according to the laws of pneumatics.

“ A few particles, for instance, driven from the surface of the body, drive their neighbouring particles into a less space; and the medium, as it is thus rarefied in one place, becomes condensed in the other; but the air thus compressed in the second place, is by it's elasticity returned back again, both to it's former place, and it's former state; and the air contiguous to that is compressed; and the like obtains, when the air less compressed expanding itself, a new compression is generated.

“ From each agitation of the air, therefore, there arises a motion of the air, analogous to the motion of a wave on the surface of the water; which we call a *wave* or *undulation* of air.”

According to this theory, sound operates on the air, in it's fluid quality.

But in order to support the theory of it's reflecting, another operation is given it, contradictory to the last; namely, that sound is propagated by direct rays, and acts upon the air in it's divisible quality. Accordingly Kircher\*, and most that follow him, after explaining the progress of sound to be undulative, go on comparing it's properties to that of light; which is clearly confuted by Sir Isaac Newton, who says “ a pressure on a fluid medium, *i. e.* a motion propagated by such a medium, beyond any obstacle, which impedes any part of it's motion, cannot be

\* Musurgia Universalis.



propagated in right lines, but will be always inflecting and diffusing itself every way, to the quiescent medium beyond that obstacle. The power of gravity tends downwards; but the pressure of water arising from it, tends every way with an equable force, and is propagated with equal ease, and equal strength, in curves, as in straight lines. Waves, on the surface of the water, gliding by the extremes of any very large obstacle, inflect and dilate themselves, still diffusing gradually into the quiescent water beyond that obstacle. The waves, pulses or vibrations of the air, wherein sound consists, are manifestly inflected, though not so considerably as the waves in water\*; and sounds are propagated with equal ease through crooked tubes and through straight lines; but light was never known to move in any curve, nor to inflect itself ad umbram."

Several instances cited by Kircher contradict the theory of *reflection*.

Bortelli † in the former part of his work seems inclined to disbelieve this doctrine of *reflection*; but not being able to account for the echo by any other means, allows and attempts to explain in what manner echoes are the effect of *reflection*.

Perç Merfenne, upon the same principle, has undertaken to give the form that shall produce echoes; and it is upon this, that the idea of a secret chamber or oval room took its rise. It is the property of the oval, that having found the two focuses, A A, fig. 6, pl. 1, the rays of incidence proceeding from either of these focuses will be all *reflected* to

\* See experiment on Prop. IV.

† Del Suono, &c.

the other; and therefore if this effect is allowed to sound, a whisper from a person placed at one focus, will be heard by another person placed upon the opposite focus, at the same time that it would not be heard in any other part of the room. I cannot learn that this has ever been tried.

If we allow this effect to sound, we must lose all idea of it's acting upon the air in an undulative manner, and suppose it to proceed in an infinity of rays, the contrary of which has already been proved.

None of the remarkable instances of hearing a whisper are occasioned by this form. The gallery under the dome of St. Paul's church is circular; the gallery over the east choir of Gloucester cathedral is straight; the Claudian aqueduct is strait; and the prison of Dionysius at Syracuse is a parabole.

In all the remarkable instances of hearing a whisper, the necessary situation is at or near the wall. Were they occasioned by *reflection*, the contrary would be the case: a spot must be found in which all the *reflecting* rays would be concentrated.

With respect to echoes, how would *reflection* occasion a repetition three or four times, at the side of an Egyptian pyramid, mentioned by Plutarch? The same may be observed of the sepulchre of Metellæ near Rome.

The Villa Simonetta near Milan has often been cited as an indubitable instance. The Jesuits constructed a similar edifice at or near Prague, in order to produce the same effects, but it did not succeed; nor has it yet been proved, why the like buildings in other places, do  
not

not echo ; and the same reasoning never has answered for any two places where echoes are produced \*.

In all the experiments I was able to make, I could not find one instance that gave the least ground for maintaining this theory. I generally tried long rooms with square ones, but the distance of hearing was nearly the same. Thus fig. 7, pl. 1, represents a long narrow room ; suppose the speaker at A, the volley of sound passing in a direct line through the middle of the room, according to this doctrine, should be aided by the infinite number of *reflecting* rays, meeting together and proceeding with it.

Like the dashing of waves against the sea-shore, sound may be supposed to be beat back ; but this is very doubtful, first by reason of the imbecility of air, and secondly because all bodies greatly attract sound, which is absorbed or conducted by them according to the nature of their material.

\* The French Encyclopædia, after having summed up the reasons, given by different authors, proceeds to say, “ Mais il faut avouer, que toute cette théorie est encore vague, et qu’il restera toujours à expliquer pourquoi des lieux qui, suivant ces règles paroîtroient devoir faire écho, n’en font point ; pourquoi d’autres en font, qui paroîtroient n’en devoir point faire, &c.” And again, “ La comparaison des lois de la réflexion du son avec celles de la lumière, peut être vraie jusqu’à un certain point, mais elle ne l’est pas sans restriction, parce que le son se propage en tout sens, à la lumière en ligne droite seulement.”

## P R O P. VII.

*Of the Property of different Materials to alter and conduct Sound.*

• To ascertain the progress of sound in *air* it would be necessary to place two high and slender poles at a proper distance; from the top of which the experiments should be made, the density of the *air* ascertained, and the whole compared with the extension of sound on a plane. From the best observations I could make, sound extended in *air* in a degree nearly equal to its extension on a plane, i. e. a field of turf or a meadow, which is always to be understood when the term plane is here made use of.

I did not find an opportunity of comparing the progress the voice made on *earth* upon any open paved surface, free of enclosures: but I always remarked the sound was much depressed on earth, and very different from the sound in other situations.

*Earth* may be supposed to have a twofold property with respect to sound. Being very porous, it absorbs sound, which is counteracted by its property of conducting sound, and occasions it to pass on a plane, in an equal proportion to its progress in air, unencumbered by any body.

If a sound be sufficiently intense to impress the *earth* in its tremulous quality, it will be carried to a considerable distance, as when the earth

is struck with any thing hard, by the motion of a carriage, horses' feet, &c.

*Plaster* is proportionably better than loose earth for conducting sound, as it is more compact.

*Clothes* of every kind, particularly woollen cloths, are known, extremely to prejudice sound: it's absorption of sound, may be compared to it's absorption of water, which it greedily imbibes.

A number of people seated before others, as in the pit or gallery of a theatre, do considerably prevent the voice reaching those behind; and hence it is that we hear so much better in the front of the galleries, of of any situation than behind others, though we may be nearer to the speaker \*. Our seats rising so little above each other occasion this defect, which would be remedied, could we have the seats to rise their whole height above each other, as in the ancient theatres.

*Paint* has generally been thought unfavourable to sound, from it's being so to musical instruments, whose effects it entirely destroys.

\*Musical instruments mostly depend on the vibrative or tremulous property of the material, which a body of colour hardened in oil must very much alter; but we should distinguish that this regards the formation of sound which may not altogether be the case in the progress of sound.

The whispering gallery at St. Paul's is entirely *painted* in oil: it will however be difficult to ascertain what difference it may produce.

It is this has given occasion to suppose sound ascends.

*Water*

*Water* has been little noticed, with respect to it's conducting sound; but it will be found to be of the greatest consequence. I had often perceived in newly-finished houses, that while they were yet damp, they produced echoes, and that the echoing abated, as they dried, which led me to make a very particular examination.

EXP. When I made the following experiment there was a trifling wind; consequently the *water* was proportionably agitated. I chose a quiet part of the Thames, near Chelsea Hospital, and with two boats tried the distance the voice would reach. On the *water* we could distinctly hear at the distance of 140 feet, on land at that of 76. It should be observed, that on land no noise intervened; but on the river some noise was occasioned by the flowing of the *water* against the boats; so that the difference on land and on water must be much more.

Watermen observe, that when the *water* is at a stand, and the weather perfectly calm, if no noise intervene, a whisper may be heard across the river; and that with the current it will be carried to a much greater distance, and vice versa against the current.

Mariners well know the difference of sound on sea and land.

When a canal of *water* was led under the pit floor\* of the theatre of Argentino, at Rome, a surprising difference was observed; the voice

\* This canal is covered with a brick arch, over which there is a quantity of earth and the timber-floor.

has since been heard at the end with particular distinctness, where it was before scarce distinguishable.

The Villa Simonetta near Milan (see fig. 8, pl. 1) is entirely over arcades of *water*.

Another villa near Rouen, remarkable for its echo, is built over subterraneous cavities of *water* \*.

A reservoir of *water* domed over near Stanmore has a strong echo.

I do not remember ever being under the arches of a stone bridge, that did not echo; which is not always the case with similar structures on land.

A house in Lambeth Marsh, inhabited by Mr. Turtle, is very damp during winter, when it produces an echo, which abates as the house gets dry.

Kircher observes, that echoes repeat more by night than during the day: he makes the difference to be double.

Dr. Plot says the echo in Woodstock Park repeated 17 times by day, and 20 by night †. And Addison's experiment at the Villa Simonetta was in a fog, when it produced 56 repetitions ‡.

After all these instances, I think little doubt can remain of the influence *water* has on sound; and I conclude, that it conducts sound more than any other body whatever.

\* “ Sans avoir recours à des cavités souterraines, la seule figure demi-circulaire de cette cour suffit pour rendre raison de toutes les variations que l'on remarque dans cet écho.” French Encyclopædia.

† Nat. Hist. Oxford, cap. i, p. 7.

‡ Addison's Trav. edit. 1718, p. 32.

Sound on *water* is particularly agreeable, sonorous, and least altered thereby.

The whispering gallery of St. Paul's Church is entirely of *stone*; the diameter is 112 feet, the circumference 352 feet; it is surrounded by a plain wall, 17 feet high to the first cornice, over which are windows, and an order of pilastres, supporting the dome, which has an aperture at the top 20 feet in diameter; the gallery is 6 feet wide, defended by an iron balustrade all round; there are eight doors in the circumference, which whether open, or shut, makes but little difference. At the opposite sides a whisper is heard as distinctly as when close. I tried it with both persons leaning over the railing, and found a little variation. We then placed ourselves near each other, back to back. I readily perceived the whisper approach me first from behind, and there was an interval of time before it reached me in front. I lengthened my distance, and found as I advanced towards the opposite side, the two sounds became more united, and arriving there the two sounds became quite united.

This demonstrates the nature of echo; it is caused by *conduction*, and not *reflection*, as heretofore imagined. It depends on the *conductor* and the nature and form of the obstacles it meets with. This may easily be conceived in the dome we have been speaking of, which echoes four, five, six, or seven times, when the door is shut to with force. The sound is *conducted*, first by the nearest road it can find to the aperture at top, where it escapes by an explosion or *resounding*; then, taking a longer route, it makes another resonance; and so continues till it becomes too weak to be heard.



Though I have applied this reasoning to an aperture at the top of a dome, I do not mean that this is the form, necessary to produce an echo, or that the resonances are created there: doubtless many things concur to occasion a resonance, and scarce any two instances are alike: but in all, the echo may be accounted for, upon the principle of the sudden checks it may meet with at angles, &c. or suppose a dome perfectly closed and the conducting power great, the sound may be led and returned to us, by different routes, which will make so many different echoes, as is the case in St. Paul's gallery.\*

The gallery over the east choir of Gloucester Cathedral conducts a whisper in a manner somewhat similar to that of St. Paul's: this is straight and built of *stone*. "

The Claudian aqueduct is straight and built of *stone*; and the prison of Dionysius at Syracuse is a parable, and of *stone*; both with similar effects.

*Water* and *stone* united produce the greatest echoes. After water, *stone* may be reckoned the greatest conductor of sound. To what cause it may be attributed, I leave to future enquiries: I have confined myself in the present treatise to speak of facts only as they appear.

*Stone* is sonorous, but occasions a harsh, disagreeable tone, unfavourable to music.

*Brick* in respect to sound has nearly the same properties as *stone*. Part of the garden-wall of the late W. Pitt, Esq. of Kingston in Dorsetshire, conveys a whisper to the distance of near 200 feet.

*Wood* is sonorous and vibrative; of all materials it produces a tone  
the

the most agreeable, and melodious; and is therefore the fittest for musical instruments.

*Wood* has a particular vibrative quality owing to it's elasticity, and all musical instruments made of this material are of a thickness proportioned to the superficies of the wood and the tone they are to produce. But this property applies to the formation of sound, and we shall find it not so applicable to conducting the voice.

Sounding-boards in theatres are proved by experience to be of no service: their distance from the speaker is too great, to be impressed with sufficient force. Sounding-boards immediately over a pulpit may have the desired effect; provided the *case* be made of a just thickness and according to certain principles.

I have not had an opportunity of ascertaining the comparative power of *wood* to conduct sound, unless Parma theatre be cited for an example. The observation I there made was that the sound was very sonorous and clear.

The common notion that whispering at one end of a long piece of timber would be heard at the other end, I found by experiment to be erroneous. A stick of *timber* 65 feet long being slightly struck at one end, a sound will be heard at the other, and the tremor be very perceptible: which is easily accounted for, when we consider the number of fibres of which it is composed, each of which may be compared to a string of catgut.

*Wood* is sonorous, conductive, and produces a pleasing tone, and is therefore the very best material for lining a theatre; for not absorbing so much.

*much as some, and not conducting so much as others, this medium renders it peculiarly suitable to rooms for musical purposes; the little resonance it occasions being rather agreeable than injurious\*.*

And with this I shall conclude my remarks on building materials; not entering into observations at length on materials in general, it being requisite to my present purpose to take notice only of such as are essential to the construction of theatres.

*Metals* are sonorous and vibrative, producing a harsh tone, very serviceable to some parts of music.

Most wind instruments are made of *metal*, which is acted upon in it's elastic and tremulous quality, being capable of being reduced very thin for that purpose. Instruments of this kind are such as horns, trumpets, &c. Some instruments however depend more on the form than the material; as flutes, for example, "which may be made of different matters, as wood, *metal*, &c. whose parts are very different, but their particles nearly the same. If their lengths and bore be the same, there is very little sensible difference in their sounds.

\* "Daily experience teacheth us, that in a box, whose walls are naked, the finger's voice is reverberated in a particular manner; it sounds crude and harsh, and by no means flattering to the ear. The accents are quite lost, if the box be hung with tapestry; whereas they are reflected full, sonorous, and agreeable to the ear, when the boxes are only boarded; which is an obvious proof, and confirmed by experience, that the best lining for the interior part of a theatre is wood." Count Algarotti, on the Opera, Glasgow edit. p. 93.

“Hearing is scientifically defined, a sensation, whereby, from a due motion impressed on the fibrillæ of the auditory nerve, and communicated thence to the sensory, the mind perceives and gets the idea of sounds.

“A sound, in effect, is nothing but a certain rarefaction or modulation of the external air, passes through the meatus auditorius, and beats upon the membrana tympani, which moves the four little bones in the tympanum.”

I have ventured thus much into *acoustics* in order to elucidate the means, whereby sound is assisted in approaching the ear. The narrow end of the hearing-trumpet is applied to the ear, and the other end considerably enlarging, receives more impulses of the vibrating air than the smallness of the ear's surface can. These machines are made of very thin tin, whose tremulous property is easily put in action by the circumambient air: as a proof of which, let a speaking or hearing trumpet be made thicker than usual, and in proportion to the increase of it's thickness, will it lose of it's effects.

## A P P L I C A T I O N.

FROM the foregoing experiments, and observations, the following definitions may be deduced: *First*, That sound expands equally every way. *Secondly*, That to alter the form of it's expansion, the intervention of a body is necessary, *Thirdly*, That all bodies attract sound.

*Fourthly,* That sound is absorbed, and conducted by a body, more or less according to the nature of the material. *Fifthly,* That in proportion to the conducting power of the material, will be the resonance it occasions. Which being admitted, it follows, that nothing can be depended on, in a theatre, but the *direct force of the voice.*

*Of the Form most advantageous to the Voice and Sight.*

CHAPTER III.

*Of the Form most advantageous to the Voice and Sight.*

IT has been asked, why have we not in our theatres made choice of the same form as the ancients? And the answer has uniformly been, Because our manners differ from the ancients; because in adopting the semicircle, we should be obliged to leave too great an opening for the stage, &c. &c. Allowing these objections their due weight, we may add, that theatres had their rise in Greece; and from Greece the Romans no doubt took the model for their own country; that their climates required a spacious open area, as the performances were conducted during the heat of the day, before a people unaccustomed to any enclosures that shut out the open air, and where females were not generally introduced into their public spectacles: but what availed all this in their forming the plan? Let us examine the Grecian theatre. The great area \* was left for the dances and choruses. But why not have continued the ranges of seats to the line of the stage? The reason appears to me obvious, because they would not detract from the beauty and advantage of the semicircle. To this I will add, that in no one instance is their judgment more conspicuous than in the very judicious distance at which they have chosen to place the actor;—a distance so exactly

\* By Vitruvius called *orchestre*.

corresponding to the manner of expanding the voice, that to me it is matter of surprise it should ever be deviated from. The advantage of sight is also the greatest that possibly could be gained in conjunction with that of hearing; and we may further suppose that, besides preserving the beauty of form, they did not extend the seats beyond the semicircle, by reason that many of the spectators would in that case be placed with their backs inclining toward the scene.

The Roman theatre varied so little from the Grecian, that little else need be said, than that the area, instead of being appropriated to the choruses and dances, was occupied by the senators and patricians; which Vitruvius says occasioned the difference of their form.

In treating of modern theatres, I shall first speak of those that have been erected in our own country, and that of our neighbours the French, from whom it is probable we took the pattern.

In forming our first theatres, we certainly knew but little of favouring the voice, or if we did, we paid no attention to it, and were as careless with respect to the vision; I am clearly of opinion we were guided by the form of the stage. Thus the opening gave the width, and height. Sometimes they spread every way like a fan, whose larger end was opposite the stage; and this enabled them to place the galleries without greatly elevating the seats. Attached to the old manner, it was but of late years, that the French varied it; and we to this day maintain the old form.

Italy some centuries back produced several magnificent theatres; but without adhering to the good examples of the antique. They have failed

failed in proportion as they varied from them. Their opera however has been the general guide for similar structures in other parts; and they have the credit of having arrived the nearest to perfection.

From this cursory view of theatres to the present time, we will proceed to enquire what is their most advantageous form.

It is clear from the experiments on Prop. I. Chapter II. that at 17 feet from the front of the speaker will be the centre to the part of a circle formed by the expansion of the voice; and that in every part thereof the hearers will equally participate the advantages. In order to make it as capacious as possible, and at the same time to reduce the opening of the stage, we will give 3-4ths of the diameter of a circle to the body of the theatre, and 1-8th more for the frontispiece. Thus A will be the front of the stage floor, B the opening of the scene. See fig. 9, pl. 1. This will be found to produce, at all times, an opening proportioned to the size of the theatre; the greater part of the spectators will be in face of the scene\*; and it is a form that will contain the greatest number, in an equal space; all which properties will appear by the following comparison with other forms. The oval, fig. 10, for example, has been supposed to give to every spectator an equal advan-

\* Monsieur Noverre, whose judgment in what regards the *spectacle* I much esteem, says, "Les acteurs, dans toutes les circonstances, ne doivent être ni trop près, ni trop éloignés du spectateur; l'acteur doit être comme le point central du demi-cercle, que la forme des loges décrit dans sa totalité. Cette juste distance, qui n'a jamais été observée dans aucun théâtre, est indispensablement nécessaire aux charmes de l'illusion. La scène est comme un tableau, dont on ne peut sentir tout l'effet, que dans un certain point d'éloignement."



tage of sight; but those seated at the extremity only, see in a direct line; and in proportion as the spectators recede from that point, they advance the back toward the scene. This is a disadvantage attending it with respect to sight: for hearing it is by no means calculated. All forms adapted to the theories of reflection, or conduction (were these ever so clearly demonstrated), must be deficient. The main object we are aiming at, is to get as many within hearing as possible; therefore the space left for the purpose of reflection can only be in proportion as we reduce the number of auditors. The square I think preferable to the oval; it contains more in front: the sides however are bad; particularly when much extended, obliging the spectator to turn his face almost over the shoulder. See fig. 11, pl. 1.

The horse-shoe, fig. 12, pl. 1, has great merit: the front however is too far extended, in proportion to the width, being equal to a whole circle from the stage; and the straight lines narrowing towards the scene have a disagreeable aspect, and some disadvantages attending the sides of the square. In comparing these disadvantages, it is necessary to observe, that our attention is constantly engaged by the actor; that we may be content with looking once or twice at a scene, but our face is always towards the actor; therefore, those side seats, which approach the stage, look in a direct line; but as they recede from the stage, the angle becomes proportionably acute, and occasions a very painful position of the head. The dotted lines to the centre of the stage, on the four examples, 10, 11, 12 and 13, clearly explain this.

What side seats are included in our design, are not only in this  
favour-

favourable situation, but are so few as not to be an object of consideration.

It has been proved by the experiments on Prop. II. Chap. II. that in a given distance we hear worse the higher we are situated; and as such a situation is equally bad for viewing, it will be proper to keep down the ceiling of the theatre as low as may be, agreeably to the necessary accommodation and beauty of the building. It does not however appear that heightening the ceiling will in any wise sensibly affect the voice; it will in all cases be a conductor of sound to the upper range of seats, which leaves us at great liberty in that respect. To me, the proportioned height appears to be 3-4ths of the diameter, or the length from the stage to the front of the opposite boxes. Suppose the diameter of fig. 9, pl. 1, to be 60 feet, it will follow that the height should be 45 feet from the level of the stage: which height includes all the visual rays within the angle of 45 degrees. With regard to the size, it would not be advisable to have a greater distance than 60 feet from the stage, on a level with the speaker, or 70 feet to the utmost extent, in either theatre or opera-house. They are equally subservient to the same laws of hearing and seeing; both of which are defective when that distance is exceeded. We may certainly erect very noble and magnificent theatres, and such there are; but they cannot be said to have any conformity to the purposes for which they were designed.

## CHAPTER IV.

*Of finishing a Theatre.*

IN treating of the detail, I think it necessary to distinguish between our theatres for dramatic representations and the opera; the requisites and accommodations expected in each being very distinct, according to our usages: I shall therefore commence with the theatre.

So prevalent is the force of habit, that it is at all times necessary for an architect to accommodate his designs to it; reserving to himself the liberty of explaining what is and what is not to the general advantage of the edifice.

*Of the Boxes.*

WE have been accustomed to have the different ranges of boxes open, so that little or nothing intervenes to prevent there being one continued and plain wall at the back, and the same for the parapet in front. All the doors should be made to shut close and flush with the  
side

side next the theatre \*. The columns, &c. in front, if necessary to support the galleries, or different ranges above, will remain a matter of choice, whether to adopt them of the usual proportions, or apply small iron ones. The first will add to the beauty of the design, the last will less obstruct the sight, and the separations elbow high can do little injury.

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*Of the Pit.*

THE entrances into the pit have always been found disagreeable and inconvenient to the audience. Some have pretended that the doors placed at a distance from the stage prejudice the voice †; but I rather imagine it has always been found necessary to place them near the stage, in order to obtain height for the entrance; for if the door is shut and made flush, what difference can it make? And if the disturbance always there occasioned be made the objection, it seems to me to be immaterial where this happens, the pit being so central that a noise made in any part

\* Our hearing better when the doors are shut, does not altogether arise from the sound being thereby confined. The actor's voice by the time it reaches this distant part of the theatre becomes very feeble and is easily destroyed, even by a whisper; the consequence therefore must be much greater, when the doors are continually opening, and the outward noise admitted.

† The reason given in the preceding note for keeping the doors close in the boxes, applies here against placing the pit-doors at the remotest distance from the stage.

of it will equally affect the whole house. The height will always be regulated by the stage, so that the audience may conveniently see what is passing.—It is necessary also to add a caution, that we do not, in imitation of some foreign theatres, place enclosed boxes round the pit. This is the place where they would do most injury: all round, as was said before, should be one continued plain wall to the top of the parapet of the boxes.

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*Of the Galleries.*

THE same observations will in general serve for the galleries. The receding of the upper one has always been found of utility, on account of the noise and clamour continually raised there by an English audience.

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*Of the Ceiling.*

I CANNOT find that the form of a ceiling will operate much upon the voice. It should be plain and without cavities: the apertures necessary for changing the air should have covers to fit close, and be opened only between the acts.

*Of*

*Of the Opera House.*

THE divisions of an opera house vary much from those of the common theatre; the latter requiring accommodations for every class of people, but the former more particularly for those of the first rank, and so disposed that they who choose may be divided into separate companies. The French have nearly rejected the enclosures necessary for this purpose, under the idea that so great a number of cavities break and destroy the sound. The Italians maintain this custom, which indeed is inseparable from their idea of comfort and pleasure; and I believe we shall not readily give them up for the French improvements. It will be proper here to examine the advantages and disadvantages arising from each of these dispositions.

Under Prop. VII. Chap. II. we find that sound is continued along a plain wall, and is very much assisted thereby to a small distance. A person therefore seated in front of a box, suppose at  $\frac{7}{8}$  feet from the back wall, will evidently derive but little advantage from his being situated in front; the disadvantage then will be to the person sitting behind in an enclosed box. This must have been well observed by persons accustomed to these situations, and therefore need not be enlarged upon here.

To make some amends for the many cavities when enclosures are employed, we should increase, as much as possible, the surfaces in front of the boxes, which include the entablature or moulding, together with the parapet above it: these should be perfectly plain, as was remarked before;

and, instead of projecting balcony-like fronts, I would recommend, that the divisions between the boxes recede to such a distance from the front as may be judged proper; and this may be and has been so managed as to have a good effect.—The quantity or width of the surface in proportion to the opening above, must be left to the good management of the architect, who will bear attention to the ladies; for they certainly will object to the opening, if it is so low as not to give free room for the head-dress when they stand up: but ample amends may here be made by heightening the parapets.

The pit here being appropriated to the first rank of people should have more entrances to facilitate the frequent removals of this part of the company.

A well-disposed gallery, I make no doubt, would turn to a good account. In general they have been so miserably situated, as to prevent that part of the public from visiting the opera who could not afford the first price.—I would propose an entire abolition of the upper gallery, and in its place make the other more spacious and commodious. Here the voice might be very much assisted, by avoiding the frequent cavities practised next the ceiling in order to form the upper gallery. The ceiling, whether level or coved, would by this method lead the sound into the gallery, and render it a very desirable situation; provided there were no projecting cornice at the foot of the cove, for which a painted cornice might be substituted, and it would answer the same effect.

*Of the Orchestre.*

THE orchestre has hitherto received but little attention in England. I have observed in several theatres in Italy, that the effect there produced has been surprisingly different from our's. Their manner of forming it is this: Under the orchestre is built a counter arch (see fig. 14, pl. 1), upon which is laid the floor, and at each end of this arch is joined a pipe, which opens underneath the stage. I have been informed that the effect of the orchestre at the Argentino at Rome was greatly augmented by raising it: which doubtless must have been the case, were it much below the stage before. This is a part attended with so little expence, that it will be well worth a manager's attention to try various methods. Rousseau de Geneve, in his *Dictionnaire de Musique*, has proposed erecting one entirely insulated, upon the principle of a musical instrument.

*Of the Frontispiece.*

IN the frontispiece more care is requisite than is generally imagined; for upon this in a great measure depends the effect the scenery will have upon the spectators. By an attentive observation we shall find that the massy columns and pilastres, together with the many orna-



ments accompanying them, engage the eye from the scenery, and occasion it to have a comparative littleness. I could not but remark in a theatre where the finishings were plain and continued to the scene, the grand effect that the scenery produced, particularly of the architectural kind. The great difficulty of accommodating this immense opening to any reasonable idea of good architecture, must be obvious to every one who has visited foreign theatres, particularly those in Italy; where some of the greatest reputation have large projecting consoles resting on the columns, to avoid the appearance of the seeming ponderance of the architrave and the soffite of the frontispiece, or what is generally called founding-board. And as under Prop. VII. Chap. II. we find the founding-board of no use, but when placed near the voice and operating as an instrument, by the elasticity and sonorous quality of the wood-case, the architect will be left at liberty to make it conformable to the rest of his design, paying attention to the scenery. A division is necessary between the theatre and the stage, and should be so characterised as to assist the idea of there being two separate and distinct places. I would advise it to be quite plain, without any ornament whatever. The boxes, which have been sometimes continued to the scene, greatly lessen the effect; but I do not think they injure the voice. The great advance of the floor of some stages into the body of the theatre is too absurd \*, I imagine, ever to be again practised;

as

\* "As most people are captivated with what appears grand and magnificent, some were induced to resolve on having a theatre built of an excessive extent, and out of all reason,

as the performance is chiefly conducted on that spot where the entrances and exits are made; and short scenes will not admit of the actor's advancing; besides that all plots, which compose so great a part of dramatic representation, must be among the machinery; and above all, most performers will not be at the trouble of advancing even when the best of opportunities offer. Rounded fronts are also useless; for when can an actor come to the extremity? If alone, he cannot stand fixed; and to march up and down the stage would be ridiculous; to make circular motions, would be worse; and if he attempted to move to and fro, in a straight line, he would tumble over the laps. The stage front then should be

where however they should hear commodiously; which to effect, they made the stage whereon the actors perform, to be advanced into the parterre several feet; by that expedient, the actors were brought forward into the middle of the audience, and there was no danger then of their not being heard. But such a contrivance can only please those who are very easily satisfied: for who that reflects, does not see that such a proceeding is subversive of all good order and prudent regulation?

“The actors, instead of being so brought forwards, ought to be thrown back at a certain distance from the spectator's eye, and stand within the scenery of the stage, in order to make a part of that pleasing illusion for which all dramatic exhibitions are calculated. But by such preposterous inversion of things, the very intent of theatric representation is destroyed; and the proposed effect defeated, by thus detaching actors from the precincts of the decoration, and dragging them forth from the scenes into the midst of the parterre; which cannot be done by them without shewing their sides or turning their shoulders to a great part of the audience; besides many other inconveniences: so that what was conceived would prove a remedy, became a very great evil.” Algarotti on Op. Glasc. edit. p. 99.

straight,

straight, and project no more before the scene than does the frontispiece ; and both should project as little as possible.

*Of the Manner of lighting a Theatre.*

IN laying out a theatre, regard should be had to the manner of lighting it ; of which several methods have been tried, but none have as yet reached the perfection wished for. The French, to prevent the glare occasioned by the number of candles in the manner they are placed by us, suspend a large chandelier from the centre of the ceiling, which in some theatres is let down only between the acts : but the obscurity this occasions is objected to by most other people, and if suffered to remain during the performance, it interferes too much with the sight of those seated above. Some have silk surrounding the lights ; but this does not prevent the light from offending those who sit under. Others have proposed lights to be placed above a cornice, to be reflected by inclined reverberators fixed against the cove ; and this might be a judicious arrangement, if the great glare of the reverberator could be softened. Perhaps thin silk might here answer the purpose, and render the light exceedingly pleasant and sufficiently brilliant. Monsieur Patte has proposed a method to light the *avant-scene* without that tormenting line of lamps at the front of the stage, which wrongs every thing it illumi-

illuminates. He would have reverberators placed at the extremity of the boxes, on each side of the stage; and this has been practised in small theatres with success, particularly at Blenheim, and it is well worth the trying in larger ones.

*Of the Material.*

WOOD, being of all materials the most favourable to sound, should be adopted in a theatre, in preference to every other, not only in the divisions, but the walls; and even the ceiling should be lined with it: for which purpose recourse must be had to an ingenious joiner, as by his assistance great effects may be produced in an immense theatre. That of Parma is so decisive an instance that we need not go farther for proof.

In lining the ceiling and walls, care should be taken to leave sufficient room behind not to hurt the elastic property of the boards; they should be united in the most artful manner, and the bearers to which they are fastened placed at the greatest possible distance. The parapets and other divisions will afford a good opportunity of making them into a sort of cases by the double lining; and a void should be managed under the pit-floor, as well as over the ceiling. No carved work, projecting ornaments, modillions, dentils, &c. of any kind, should have place;

place ; the painter may here exert his talents with great latitude, and make more than ample amends ; and such mouldings as are necessary in parts near the eye should be perfectly plain and without breaks. The very fashionable manner of lining the boxes with paper, and having festoons of silk and damask, should by no means be suffered. .

## CHAPTER V.

*Of the necessary Appendages to a Theatre; the Stage, and adjoining Parts.*

THE whole of the theatre should be surrounded by a thick wall, as well next the stage, as on every other part. Over the opening of the stage an arch may be turned, on which the wall may be continued up quite through the roof, so as to prevent all communication of the timbers. The passages communicating with the boxes should all be arched, and have an easy access to spacious stone stair-cases, that would in case of fire enable the audience to depart without the least hazard; and though it be necessary to confine the entrances to a few in number, yet there ought to be many large doors, hung on the outside \*, ready to be thrown open at the conclusion of the performance, and upon any sudden alarm. Partition walls should be carried quite through the roof in as many places of the building as

\* The dreadful consequence of doors hung on the inside cannot be too much attended to. Thousands have fallen a prey to the flames, through that single circumstance. When an alarm takes place, all are eager to gain the outside, and the crowd carry the door with them, till it shuts; others pressing forward, prevent its being opened; and thus are they confined to destruction. The dreadful instance, cited by Monsieur Noverre, is too shocking to be repeated.

opportunities afford; and no one would neglect to render it insulated where it is possible.

The additional parts of a theatre will always depend on the degree of magnificence, the sum of money intended to be expended, and the different entertainments meant to be given in such a place. We shall however confine ourselves to those we think absolutely necessary to accompany a théâtre.

The saloon, or what we generally term coffee-room, is so necessary that the managers of the present théâtres find their account in adding one. The purpose of this place being for recreation and taking refreshments, it should be spacious and conveniently fitted up with seats, &c. in recesses; with a proper situation for the bar. The ornaments should be gay, and the whole carry with it an air of cheerfulness, be conveniently placed near the principal entrance, and so disposed as not to interrupt the audience by the company's passing to and from it. The passages behind the boxes should always be preserved for their use only.

A waiting-room should also be contrived on a level with the street, just within the paying-door, for the accommodation of those attending the arrival of their carriages; and a lobby or hall opening to the street for the servants, &c.

*Of the Stage.*

THE stage and it's accompaniments may be regarded as a distinct part of the building; being for the accommodation of the scenery with all it's attendant machinery, actors, dancers, assistants, &c. &c.

The stage, no doubt, should be proportioned to the size of the theatre. Some think regard should be had to the kind of spectacle intended to be exhibited. For example, the opera requires much space for magnificent ballets, &c.; and as it would be injudicious to build a theatre larger than the extension of the voice will allow, so on the other hand it would be wrong in a great and populous city to build one less. Therefore the extending or diminishing of the stage beyond a certain rule may be left to the discretion of the manager. I shall however endeavour to lay down some guide. In a full-sized theatre the opening should not be less than 35 feet nor more than 45 wide, and of a proportionable height;—the length of the stage will be 1 and  $\frac{1}{2}$  of it's breadth at the opening, leaving good passage room behind the uttermost scene\*;—on each side of and between the scenes

\* “Il faut que la partie, proprement dite de la scène, ne soit ni beaucoup plus longue, ni beaucoup plus large, ni beaucoup plus élevée que celle qui vient d'être la proie des flammes.” The opera house at Paris, to which Monsieur Noverre here alludes, was 38 feet 3 inches wide, 34 feet high, and in length about 1 and  $\frac{1}{2}$  of it's breadth.



and the wall ample room should be left for forming the different bodies of dancers, choruses, guards, &c. in readiness for entering on the stage; and on either hand beyond this a depository for the scenes and machinery, opening by arcades to the stage. Thus every distinct service will have it's allotted place.

The absolute necessity of such an arrangement was so much experienced by Monsieur Noverre, that he has not hesitated to require a distance of 45 feet from the angle of the stage-opening to the exterior side wall; a circumstance to be by all means attended to where practicable \*.

Both above the scenery and below the stage the heights should be proportionably increased. Instead of 6 or 7 feet, the height usually given under the stage, I would propose 20 or 30. This would give

\* “ Un théâtre ouvert dans ses flancs permet au peintre-décorateur de *sauter* des chassis, par la raison que la distance qui regne entr'eux et le mur, lui facilite le moyen de leur donner plus de largeur; de sorte qu'une décoration, composée d'un fond et de trois chassis, paroîtroit plus vaste et plus *grandiose* que celle qui seroit formée de huit chassis étroitement resserrés. On sent qu'il est impossible, dans cette dernière distribution, de pratiquer de beaux percés, et de beaux échappemens de vue: aussi se plaint-on de la monotonie, du froid et de la sécheresse qui regnent dans les décorations; elles n'offrent que des rues droites, que des allées d'arbres ou de colonnes, et le point de perspective angulaire & pris de côté, dont les célèbres *Bibiena* et *Servandoni* se sont si heureusement servis, n'a pu être adopté sur un théâtre étranglé vers le fond, et trop resserré dans ses flancs.” Monsieur Noverre. Converse with an eminent scene-painter on this subject, he observed to me that he conceived the advantage of fewer side scenes to be so great, that nothing but being confined by the side walls would prevent him from practising that method.

opportunity of much assistance to the machinery, and on either side the carpenters' and painters' shops might be placed communicating with the stage by trap-doors.

The green-room and wardrobe should be conveniently placed, together with the dressing apartments for men and women, which should have easy and separate communications with those two places.

# *An Examination of the principal Theatres.*

## CHAPTER VI.

### AN EXAMINATION OF THE PRINCIPAL THEATRES.

#### *Of Monsieur Patte's Design for a Theatre. Pl. 4.*

**I**N the examination of theatres I have thought proper to commence with Monsieur Patte's designs, which will direct us how far we may allow his theory to prevail.

He sets out upon the principle, *that the angle of reflection of a body which strikes a surface that resists or repulses it, is always equal to the angle of incidence*; and supposing sound to be susceptible of this action, he proceeds to make choice of the oval, being a form which reflects all the rays from one focus to the other. He cuts off one end at about  $\frac{1}{4}$ th of it's length for the stage-opening, which consequently places the actor near one of the focuses: the size of his theatre remains 57 feet 6 inches wide, and the same from the stage to the opposite extremity.

We have endeavoured to prove the principle he lays down, in Prop. VI. Chap. II. by which we at least see how little dependance ought to be placed upon reflection; and had the principle been admitted, still the effect must have been altered in the form proper for it, when

when filled with spectators. At the sides the quantity of space, lost, and that the most favourable for hearing, may be seen by comparing his design with our proposal of a plan. Although the distance from the stage to the extreme box is greater than in our design for the opera house, yet it contains of equal-sized boxes six less in each range; and in order to leave surfaces sufficient, as he supposes, to answer his purpose, he makes but four ranges of boxes in a height that would admit of six of our's, supposing no gallery. His plan would give seventy-six, our's one hundred and fifty boxes.

With respect to sight, it is still more deficient. His own commendation of his plan is, that few spectators are entirely deprived of seeing; and we may also observe, that very few indeed see to any advantage; for if we take away the five central boxes, and draw lines as represented on the plan, pl. 4, the others make but a small curve beyond those lines, and may be said to be ranged so as to form an acute angle of only twenty degrees; so that, exclusively of those in the pit, three parts out of four of the spectators are disadvantageously placed.

The stage is so exceedingly circumscribed at each side of the scenery, that I cannot imagine Monsieur Patte gave that part a moment's attention.

*b b*, Fig. 1 and 2. Reverberators at the end of boxes to light the proscenium, instead of a line of lamps at the front of the stage.

*c c*, Fig. 1 and 2. Other reverberators to light the scones.

*d*, Fig. 2. Principal reverberator to light the theatre.

*Of the Ancient Greek and Roman Theatres.*

I HAVE given the figures of ancient theatres from Vitruvius, as explained by the Marchese Galliani; to whose excellent edition of that author I shall refer my readers, for a more particular account of the manner of describing them and their several proportions.

The Roman theatre, pl. 2, fig. 1, was divided into three principal parts; namely, the proscenium, or pulpitum, A; the orchestre, B; and the theatre, C. The proscenium (by us called the stage) was the part destined for the performance; the floor was more particularly distinguished by the term pulpitum, and was long and narrow; the scene consisted of an elegant piece of architecture, representing the front of a palace; which being fixed, and Vitruvius, together with several other authors, mentioning three changes of scenery, it is now generally admitted that painted scenes were at times suspended or placed before this, to which the three prismas *d, d, d*, turning round on pivots on each side, concur.

The orchestre (with us the pit) was appropriated to the use of the senators; which Vitruvius ordains should not be more than five feet below the pulpitum. There were six entrances, *e, e*, to this place.

The theatre was appropriated to the public; the form a semicircle, and divided into three or more separate parts; the first two, *f, f*, for the populace, and the third, *g*, for the women. The first two consisted of

ranges

ranges of seats rising their whole height above each other ; which were to be not less than 20 nor more than 22 inches high, and not less than 2 feet nor more than 2 feet 6 inches broad ; above which was the third part, being a corridore open towards the scene.

In cavities at proper intervals, under the seats were placed musical vases, *b, b*, fig. 3 and 4, answering to the different notes in music, which strengthened and spread the sound to every part.

There were distributed, at proper intervals, doors and separate staircases, *i, i*, leading to the several departments ; which by their number rendered the access and departure easy and expeditious ; and the whole was surrounded by spacious corridores, which served for recreation and shelter from rain. The theatre was open to the sky, except the gallery at top, which was roofed ; and a cloth was suspended to shelter them from the rays of the sun.

The Grecian theatre, pl. 2, fig. 2, according to Vitruvius, differed but little from the Roman, except that the pulpitum receded more from the audience, thereby giving space to the orchestre, where were exhibited the dances, &c. The pulpitum here was not to be less than 10 feet high. These regulations, however, were not always strictly observed ; for in the theatre of Bacchus at Athens (see Stuart and Revett, Vol. II.) there is not room to suppose it varied from the Roman form ; on the contrary many remarkable instances exist in Italy of forms which Vitruvius calls Greek.

Their performances were conducted during the day, and given gratis

to the people, generally on public festivals; and often the same theatre served for both the drama and exhibitions of fights of gladiators and beasts.

Thus having shewn and compared what is already known of ancient theatres, I shall proceed to make some remarks thereon.

Instead of depreciating their taste, I think these would be instances sufficient to satisfy us of their superior knowledge and abilities; and it is matter of astonishment to me that they could in such an extent make their exhibition any way tolerable; that they did so we have the testimony of many authors.

Pliny mentions the ill effects the vases produced in his time; but it was the necessity of providing for so numerous a company of spectators that obliged them to have recourse to artificial means of extending the sound.

Although we have undoubted authority for these various circumstances attending their theatres, I do not conclude that the case was the same with all; but that where circumstances permitted they did enjoy the drama in its utmost purity. For example, the largest theatre at Pompeii does not greatly exceed the dimensions we should admit at this day, and the smaller one we should esteem very moderate. In addition to these I may be allowed to name the remaining one at Athens; which, from its being so much celebrated, we may conclude was the most splendid and the largest they would allow in that country. In the theatres at Pompeii I did not observe any of the cavities or vases described

described by Vitruvius ; neither are there any in the theatre at Syracuse, the seats being cut out of the solid rock.

If we compare the form of their plans with what is known concerning the extension of sound, we shall find it the most just that could have been adopted. The Greeks took the form in which the voice naturally expanded, maintaining however only the semicircle in front of the speaker. The Romans took the form in which sound naturally expanded, and they may be defended from the circumstance that actors do not always speak facing the centre of the audience ; but as the greater part of the performances is conversation between two or more actors, they cannot but turn towards the person they are supposed to be addressing themselves to, and consequently the additional direct force which sound receives in a line fronting the speaker is hereby lost. This decides the utmost latitude we can be allowed in the forms ; nor can we deviate from it without wronging some of the audience.

The great elevation of the seats rising their whole height above each other was advantageous, commodious and beautiful ; there was nothing to intercept the sight or impede the voice \*. Unfortunately our customs will not admit of so judicious an arrangement.

\* At Verona they have erected a stage, in the area of the amphitheatre, where it is usual to perform in the summer evenings. When present at one of the representations, I could not help remarking how distinctly I heard at the very top of the seats, at the distance in a direct line of about 160 feet. To account for this extraordinary instance of the extent of sound, I suppose the stone seats (most of the upper ones being empty) were conductors to the voice.



Their stage had long been condemned by the moderns, as not affording opportunity for good scenic representations, till the Marchese Galiani first interpreted the meaning of Vitruvius; since which little doubt remains of their having succeeded as well as ourselves. I have already in Chap. III. given my opinion that the stage regulated the forms of our first theatres; and the semicircle has always been immediately objected to, as occasioning too large an opening. The chief argument in favour of a narrow receding stage is, the quantity of changes we make use of, particularly in the pantomimes, where extent of depth perhaps is necessary to the many transformations; on the other hand, the numerous side scenes requisite to fill up a depth are the greatest impediments a machinist has to encounter with; at the best they have an unnatural appearance, and cannot be seen to a good effect except at one point. In this they all agree, and one of the most esteemed scenists informed me that to obviate this difficulty he always brought the scene as near the front of the stage as the subject would admit of. With respect to the dances and choruses, it will remain matter of opinion whether it be better to place them performing one behind another, whereby great part are hid from the spectators, or to arrange them in view by means of a broad stage.

Throughout the ancient theatre I see so little to object to and so much to commend, that I could continue to dwell upon it with infinite pleasure; nor can I too much recommend an attention to the precepts delivered by Vitruvius; for after all our researches we rest just where he left us. Those who are not inclined to respect the authorities of  
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the ancients may be told, that this author has very ably treated of resonance, reflection, &c. and has given to each the latitude it deserved: nay more, he has converted the first to an utility so great in its effects as to excite our admiration and astonishment. I cannot but consider architecture as particularly favoured by Providence in the preservation of the labours of so great a master, comprised in so few but comprehensive words; how glorious the opportunity, after viewing the great works of antiquity, of being able to consult this author for the methods by which they were produced, and to learn the grounds on which these respected ancients formed and adapted works, estimable even now in a state of ruin! Upon such occasions I cannot help imagining myself in their company and charmed by their instruction. Why do we so little succeed in our attempts in this art? If I may be allowed to hazard an opinion, it is not from a want of having the means in our power, but because we neglect their rules; we are not content with the graceful simplicity they inculcate, but are continually endeavouring in all we undertake to make our own poor additions conspicuous. Of late, however, we have been rapidly approaching to the form of their plan; and I shall not be surprised if I live to see it adopted; for every thing that has been written and demonstrated upon theatres tends to shew its perfection.

Having entered upon the subject of ancient theatres, I thought a comparative view of some of their principal remains would be acceptable. Pl. 3, fig. 1, represents the theatre of Bacchus at Athens from Stuart and Revett; fig. 2, the theatre of Marcellus at Rome from

Desgodetz

Desgodetz and Serlio; fig. 3 and 4, two theatres at Pompeii: which I believe comprehend whatever variety is produced in all that we are acquainted with.

*Of the Theatre of Bacchus at Athens. Pl. 3. Fig. 1.*

THE theatre of Bacchus within the outer walls is 248 feet in diameter, which makes the radius or line from the centre 124 feet, the necessary extent of the voice: enough remains of the wall of the scene to trace the different parts; for it should be observed that the Greek and Roman theatres were not always built according to the distinctions prescribed by Vitruvius to each country. I believe all the instances we have existing are the reverse to his directions. In Italy may be enumerated the theatre of Marcellus, and those at Ferentum and Pompeii, according to the Grecian mode. In Greece, the theatre of Bacchus and (if I may be allowed to make the addition) that at Pola are built after what he calls the Latin manner.

Had Mr. Stuart attended to these circumstances, he would have found that the theatre of Bacchus corresponded with what Vitruvius calls Roman, which is proved by tracing. For the diameter of the orchestre being found by the return walls of the proscenium, four equilateral

triangles

triangles are inscribed therein \*: of these triangles that side, *a*, which is nearest the scene determines the same †, and leaves just room enough from the wall for the thickness of the columns and other architectural decorations. The stairs, *b*, led to the lower ranges of seats, and would have been rendered useless had the pulpitum projected as he supposes; and thus a semidiameter is left for the seats, being a form from which it does not appear they ever deviated. *c* is a door immediately over *b*; which led to the upper ranges and corridors from the stairs *dd*. The pulpitum I suppose to have projected as far as the side walls; and this accounts for the outer wall being continued beyond the semidiameter, and accommodates this plan in some measure to their usages, by confining the pulpitum and adding to the orchestre ‡.

The plan of this theatre is thus clearly explained, without having recourse to Mr. Stuart's improbable conjectures; of which, as they come from a man of such accuracy, and are contained in a work of so great

\* In eaque quatuor scribantur trigona paribus lateribus et intervallis; quæ extremam lineam circinationis tangant. Vitruv. lib. v. cap. 6.

† Ex his trigonis, cujus latus fuerit proximum scenæ, ea regione, qua præcidit curvaturam circinationis, ibi finiatur scenæ frons. Vitruv. lib. v. cap. 6.

‡ Ideoque apud eos tragici et comici actores in scena peragunt: reliqui autem artifices suas per orchestram præstant actiones. Vitruv. lib. v. cap. 8.

Nec tamen in omnibus theatris symmetriæ ad omnes rationes et effectus possunt respondere, sed oportet architectum animadvertere, quibus proportionibus necesse sit sequi symmetriam, et quibus rationibus ad loci naturam aut magnitudinem operis debeat temperari. Vitruv. lib. v. cap. 7.

estimation, I think it my duty to take some notice, and especially because they tend to perplex, instead of elucidating, this part of Vitruvius.

Mr. Stuart commences with laying down the plan of this theatre according to the Grecian proportions (see fig. 5. pl. 3.), and having found the centre describes a circle, whose radius is the distance of that centre from the wall of the scene: but he says nothing to vindicate so small an orchestre, although Vitruvius positively tells us the Greeks formed their orchestre much larger than the Romans, by reason that great part of the performance was exhibited there. Thus much serving Mr. Stuart's purpose, he chooses to fly from his text, or at least to doubt the explanation offered by M. Galiani, as producing in his circle a pulpitum scarce wide enough for a man to walk on. His own words are, "I am persuaded the pulpitum or logeum projected at least as far as to the centre; for I cannot imagine that the actors were confined to the narrow space assigned by this scheme to the proscenium, or, in other words, that the pulpitum and proscenium were, as Galiani has imagined, only different names for the same place." He proceeds to cite Pollux, as enumerating the several parts of a theatre by separate and distinct names. "He specifies," says he, "the orchestre, the logeum, the proscenium; the parasenia, &c. as different and distinct places." Now all this is decided by attending to the literal meaning of the words. The orchestre is sufficiently understood to be the space left below and in front of the seats of the theatre; the logeum or pulpitum\*, the floor whereon

\* Pulpitum, quod λογιον appellant. Vit. lib. v. cap. 8.

the drama was conducted. Proscenium is the word whereon Mr. Stuart has rested his conjecture; nor do I think Galiani has sufficiently explained it, perhaps not choosing to multiply unnecessary distinctions, which Vitruvius has carefully avoided.

Proscenium or the open space before the scene is opposed to postscenium or the parts behind the same. Thus Vitruvius when he begins to speak of this place carefully explains it—"linea ducatur, quæ disjungat proscenii pulpitem et orchestræ regionem \*." Lib. 5, cap. 6, and repeats it afterwards indifferently by the name of either proscenium or pulpitem. Again "per centrumque orchestræ proscenii regione parallelos linea describitur †," &c. Lib. 5, cap. 8, which will readily account for these two names, pulpitem and proscenium, being so often made use of by ancient authors to describe the same place: nor does Pöllux give the least reason to vary this explanation.

Parascenia ‡ I suppose to mean the opposite or side scenes. I am at a loss to imagine how Mr. Stuart could say he was persuaded the pulpitem of the Grecian theatre was meant to be projected as far as the centre, after so many and explicit directions by Vitruvius to the contrary. The difficulties he has brought himself into in maintaining his scheme are observable throughout the chapter, and have occasioned three absurdities,

\* Let a line be drawn, which may divide the pulpitem (or floor) of the proscenium and the district of the orchestre.

† Through the centre of the orchestre a parallel line is drawn opposite to the proscenium.

‡ Παρ, par, a pair, opposite—Σκην, scena, scene.

which he could not explain away ; namely a small orchestre, an extremely narrow pulpitum, and part of the spectators hid under it.

*e, e,* should be doors Mr. Stuart has neglected to describe in his plan, which may be seen in his view ; and without which the opposite stairs would be useless.

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*Of the Theatre of Marcellus at Rome. Pl. 3. Fig. 2.*

THE theatre of Marcellus was within the outer walls about 384 feet in diameter ; its radius is 192 feet, to which if we add 96 feet for the receding of the stage, the necessary extent of the voice so as to be heard in every part will be 288 feet. It would contain 13,824 persons, commodiously seated, allowing 4 feet to each ; and is the largest theatre of which we have any remains\*. As it is of a Grecian form, I have continued the line of the orchestre to a whole circle, to shew how nearly my design for a theatre corresponds with the ancient Greek. According to our division, *a* will be the stage-front, *b* the opening of the scene.

\* I am inclined to believe this theatre had no pulpitum, and that the performances were recited in the orchestre, and that it served at times for other exhibitions, such as gladiators, wild beasts, &c. In all the descriptions we have of it, nothing like a pulpitum appears.

*Of the Theatres at Pompeii.*

**P**late 3, fig. 3, represents the largest theatre at Pompeii; its diameter is about 150 feet, and its greatest extent in a line from the centre of the pulpitum 90 feet.

*a, a,* are steps leading from the pulpitum down to the orchestre.

*b, b,* are doors leading from the porticoes into the corridore at the top of the theatre, the porticoes being on the higher ground.

*c, c, c,* are other entrances.

Ib. fig. 4, represents the little theatre at Pompeii; the semicircle is interrupted by the side walls, which leave it about 82 feet wide, and the greatest length in a line from the centre of the pulpitum is 58 feet. Both these theatres have the pulpitum receding from the audience beyond the centre of the semicircle, after the Grecian manner; they are nearly alike, and have the fronts of the pulpitum or proscenium decorated with niches, &c.

*a, a,* are steps leading from the pulpitum down to the orchestre.

*b, b, b,* entrances.

*c, c,* staircases.

I have given the plan of these theatres with the whole of this very interesting part of Pompeii, containing besides them the soldiers' barracks, the forum, uniting with its porticoes for the gymnastic exercises, temples of Isis, &c. for which see the reference on the plate.



*Of the Olympic Theatre at Vicenza. Pl. 5. Fig. 1.*

**T**HIS theatre was begun by Andrea Palladio, May 23, 1580; was designed in imitation of the antique, for the Olympic academy; and scarce raised pedestal high, when death deprived the world of this artist, which happened in the August following. Scilla Palladio, his son, was chosen to finish the building.

The form of the theatre is a semi-oval placed lengthways towards the stage. The great diameter is 11½ feet; the radius or half diameter, i. e. from the stage front to the outer wall, 49 feet. It is divided in imitation of the antique, and, as in them, the seats rise their whole height above each other. The whole is terminated at top by a magnificent colonnade, open at the corners to two staircases; and niches are placed between the other columns.

The scene consists of a splendid piece of architecture, ornamented with numerous statues, &c. with three principal doors in front and two at the sides, through which are seen seven streets built in perspective; and the whole is covered with a ceiling framed of wood, 46 feet high from the stage.

In defence of Palladio, it must be said, much has been learnt respecting the ancient theatre since his time; and that he could have derived but little advantage from modern works of that kind. Widening the semicircle towards the stage was injudicious for the purpose of hearing, being directly opposite to the form which the voice naturally takes; and

to this also the colonnade open at the corners to the staircases together with so many niches and statues was prejudicial: but for sight it had it's advantages, (if we do not suppose it too narrow,) nearly all the spectators being placed in face of the scene \*.

The scenery is defective, not only as not admitting of any change, but being in itself bad: to see a number of streets through doorways leading into a palace, instead of the internal parts of the building, is ridiculous and against all probability. But in this Palladio bore no share; the records say, Scamozzi gave the designs for the streets.

This theatre has been rarely used of late years.

\* I must caution the public against a very unfair observation made by Monsieur Patte. "Néanmoins on n'a pu éviter un nombre de places de souffrance vers l'extrémité des gradins, à la rencontre des murs de séparation de la scène et de l'orchestre; inconvénient au surplus qui est commune au Théâtre antique, et auquel il n'est gueres possible d'obvier, à moins de donner une largeur excessive à l'ouverture de la scène, ou à moins de laisser ces places vacantes." It was occasioned by the receding of the seats and not by the form of their plan; and although a few were prevented from seeing to the extremity of the scene, yet were they not prevented from seeing the actor. M. Patte should have added, that he was designing a theatre in which the spectators were to be seated perpendicularly over each other; and that the front of the boxes would answer to the outer line of the ancient orchestra, in which case the semicircle and semi-oval would have an advantage no other form can pretend to. On the other hand I could easily prove that his form is the very worst that could possibly be conceived for receding seats, or galleries; so necessary we see it is to regulate our judgment by comparison.

## *Theatre at Parma.*

### *Of the Theatre at Parma. Pl. 5. Fig. 2.*

**T**HIS theatre was erected soon after that at Vicenza. It is not known who was the designer, but Bernini is said to have finished it. It has not been played in since the court was removed from hence, and is suffered to remain in a very ruinous state. It is situated on the first floor of the ducal palace.

The theatre is 130 feet long from the front of the stage to the back of the gallery above the seats, and 102 feet wide: of a very different form from that of the theatre at Vicenza; this being an oblong, rounded off at the end opposite the stage. Its divisions are nevertheless similar. The seats rise their whole height above each other, and are terminated by a magnificent corridor, like Palladio's Basilica at Vicenza; which together with the rest of the decorations gives room to suppose some one of his pupils was the architect. Between the ends of the seats and the stage is a considerable space, decorated on either side somewhat like a triumphal arch with an equestrian statue over each; from which we may conclude it was erected with a view to grand processions, &c. The interior part is wholly composed of wood; the ceiling is contrived of boards perfectly level and smooth.

The stage has no *proscenium*; the opening is very small in proportion to the theatre; being only 38 feet 6 inches square; the frontispiece is profusely ornamented with massy columns, over which is an attic;

between the columns are two heights of niches, each surrounded by small columns, entablature, &c.

This theatre is universally cited as an admirable instance of the conveyance of sound; the truth of which I can testify, having conversed in a low voice from the stage to the opposite extremity. I found but little difference by retiring 10 or 12 feet on the stage; but beyond that, the voice perceptibly varied: so that the proper distance between the speaker and hearer was 140 feet. This extraordinary circumstance is generally allowed to be occasioned by the material with which it is lined. The boards are not placed horizontally, as some have imagined to be necessary for this purpose; but nearly all against the walls are perpendicular. Some indeed object that these advantages are not real; and that were the theatre filled with spectators the absorbing materials of the clothes, bodies, &c. would destroy the effect. I can only answer that this theatre was played in so long as the court remained at Parma to maintain it; that had it been defective, that character could not have failed being somewhere mentioned; instead of which we ever find the same uniform account of its effects.

*Of the Theatre of San Carlo at Naples. Pl. 6. Fig. 1.*

**T**HIS theatre is the largest now played in, being 70 feet long from the stage-opening to the front of the opposite boxes, 70 feet wide between the same, and 70 feet from the pit to the ceiling. Its form is a semicircle whose sides are prolonged, narrowing towards the stage, somewhat similar to a horse-shoe. It contains 6 ranges of boxes, 29 in each range, separated to their whole height by partitions: in the second row, opposite the stage, is placed the King's box.

The stage has no *proscenium*; the opening is 53 feet square, and the floor advances in a circular line: behind the stage is a large door with steps, for introducing horses on particular occasions.

It is the fashion in Italy to receive visitors in the boxes, to play at cards, and often to sup there; this doubtless first gave occasion for enclosed boxes, which from thence were adopted in other countries.

The form of this theatre is a favourite one with the Italians; but it will be found on examination to extend in length considerably beyond what it ought. For example, the radius of the semicircle is 35 feet, to which add 17 for the increased direct force of sound, when thrown from the mouth, and 52 feet will be the length from the stage proportioned to a breadth of 70 feet. This by experience is found to be the

• safe; for here you cannot distinctly hear at the end, though very well at the sides \*. Upon the whole this theatre is too large, and may serve to caution us not to extend our plan beyond the probable reach of the voice.

*Of the Theatre of Argéntina at Rome. Pl. 6. Fig. 2.*

THE form of this theatre is somewhat like that of Naples, a little lengthened in proportion; it is 60 feet from the stage-opening to the front of the opposite boxes, 53 feet wide between the same, and 46 feet high from the floor of the pit to the ceiling. There are in appearance 6 ranges of boxes, 31 in each range; consequently very small and low, and partitioned to their whole height:—the upper range are mostly windows.

Like the preceding one, the stage has no *proscenium*, but the floor advances in an irregular line: the opening is 41 feet 6 inches.

• Although Monsieur Patte has thought proper to condemn this theatre, yet the universal esteem in which it is held will lead us to a more particular examination; and in conformity to the maxim we have laid down, not to proceed upon mere speculative opinions, we shall relate facts as they have been, and are proved to exist.

\* “ Je me rappelle que quoique je ne fusse pas à l'extrémité du parquet, j'avois néanmoins de la peine à distinguer la plupart des voix.” Monsieur Patte.

Formerly it was observed, that the actor was heard considerably better at the sides than at the end of this theatre; till, there being occasion to lead the water that way, a canal was made under the pit in a line from the centre of the stage, which so aided the voice in that direction that the actor is now heard equally well in every part.

At this time the enclosure of the orchestre was as high as the stage, which being inconvenient for the spectators seated in the pit was lowered considerably; but this being found to prejudice the sound it was again raised so high as to allow the musicians' heads to be above the stage, and the success of this alteration was beyond what they had conceived.

If we compare these circumstances with the known operations of sound, we find the length to be 17 feet too much in proportion to the breadth of 53 feet; which corresponds with the former observations made in this theatre.

These different effects of the orchestre will shew that it ought not to be too much sunk, but on the contrary elevated as much as conveniently may be. This will be against the sentiments of those who favour reflection; for according to that principle, when the orchestre is low and the stage considerably higher than the enclosure, the body of sound would be more confined to the theatre, and the reflection from the side under the stage should add to it's strength. These effects also prove that sound acts with greater force where it has room to expand every way, or at least that any confinements at the sides or back will not assist it.

*Of the Theatre at Bologna. Pl. 7. Fig. 1.*

**T**HIS theatre is 66 feet in length from the front of the stage-floor to the front of the opposite box, and 12 feet more to the scene; 57 feet wide between the boxes; and 63 feet 6 inches high from the pit-floor to the ceiling. The stage-opening is 51 feet wide, ornamented with four maffy columns upon which rest large consoles supporting the fofite. There are 5 ranges of boxes, 25 in each range, besides those in the *profcenium*; all built of brick and ftone, with columns placed in front of the four loweft ranges, and arcades between the columns of the firft two. The pit is furrounded by two rows of feats; the upper one defended by a baluftrade.

Bibiena the famous ftage-decorator is by fome faid to have been the architect; by others the work has been attributed to Galli, his fon. If we regard this theatre merely for viewing the fcenic representations, we muft allow that the form is happily adapted for that purpofe; which certainly was the intent of the designer, and will always be the cafe where the manager of any particular department is employed to lay out a building of this kind: his whole attention will naturally turn toward his own occupation, and the form will be regulated accordingly. If we except the advantage it has for viewing the fcenery, few theatres rank in a lower degree of eftimation than this. The length is immense in proportion to its breadth, and may be faid to be too much by 30 feet.



The excessive number of it's columns, arches and balustres, contribute greatly to injure the sound, and the material of which it is built renders it particularly harsh and disagreeable; and this latter circumstance serves to shew that however much we may wish to have the internal parts of a theatre proof against fire, this cannot be attained without preventing at the same time the very enjoyment for which it is erected.



*Of the Theatre of San Benedetto in Venice. Pl. 7. Fig. 2.*

THIS is aptly called the Bottle Theatre, to which it bears a resemblance in the plan. It is given here rather as a curiosity, than for any thing we can learn from it. A sight of the plan will be sufficient to shew what an absurdity exists in the world.

*Of the Theatre at Imola. Pl. 7. Fig. 3.*

**T**HIS theatre was lately built by Cavalier Morelli. It is very small, being only 38 feet long from the stage-floor to the opposite boxes; 42 feet wide between the boxes; and 42 feet high. The stage-opening is 42 feet wide. There are 4 ranges of boxes, 17 in each range. The form of that part which is properly styled the theatre is barely  $\frac{2}{3}$  of an oval; but the ceiling is continued over the stage to complete the oval, where it is supported by four caryatides, which make three apertures upon the stage. A view of this distribution is given on plate 8.

A small theatre like the one under consideration, requires, perhaps, a stage large in proportion to the other parts, to avoid a seeming littleness in the decorations; for we shall find that habit entirely regulates our ideas of greatness. Indeed a large stage-opening is not only applicable in all instances, but is far more magnificent, capable of greater variations, and subject to very little more expence, than our common scenery.

I suppose the scene-director is inclined to allow a stage-opening of the required extent; in which case I should immediately adopt the semicircle for the form of my theatre, and continue the ceiling over the stage to complete a whole circle, with apertures for drop-scenes. The columns or caryatides, as they are at Imola, upon the stage, should

be

be moveable or calculated to receive scenes before them : which would give opportunity as on this stage of having three distinct streets leading towards the theatre ; whereby the absurdity of different persons being at the same time on the same spot and not hearing or seeing each other would be done away : the illusion would have it's full force, and there would be room for far superior decorations than any we have been accustomed to. If it is wished that the scene be more confined, which I will suppose to be generally the case, the apertures on the sides may be filled each by a single scene, and only the central aperture left open : and this also will have a better effect than our present side-scenes. For the performance of a grand ballet the columns may be removed, and a space will then be obtained sufficient for any subject, with opportunity for disposing the dancers in the most advantageous point of view. In the intervals of theatrical representations, the whole circle may be exhibited ; and it may also be appropriated to a grand fête, being capable of the most uniform and elegant adjustment. With regard to the expence of this distribution, it gives room or space, which is often wanted, for the most magnificent scenery, where cost is the least object ; and in common cases a single flat scene may be employed at a small distance in the central aperture, with two scenes to close those on the sides. This will be more elegant and natural, and attended with no greater, nay perhaps less expence than the present method.

Let this arrangement once take place, and we shall immediately become possessed of a perfect theatre, of a form the only one that completes

pletes the illusion of the stage ; a form the most agreeable in itself, exhibiting the whole company at every point of view, and the most advantageous for both hearing and seeing.

*Of the Theatre at Milan. Pl. 7. Fig. 4.*

THE form of this theatre is that of an egg cut off at the small end ; it is 71 feet 6 inches in length from the stage-floor to the opposite boxes, and 17 feet more to the scene ; 66 feet wide in the broadest part between the boxes, and 69 feet high from the pit-floor to the ceiling. The stage-opening is 43 feet wide ; there are 6 ranges of boxes, 39 in each range, separated by partitions to their whole height, besides 8 in the proscenium ; in all 239, allowing the space of three for the entrance into the pit. Each box is 5 feet wide, 6 feet deep, and 9 feet high ; most of which have private rooms on the opposite side of the corridore for the attendance of servants with refreshments, supper, &c. and the corridores are all 6 feet wide. The greater part of these boxes are private property, and a small additional price is paid at every time of admission to see the performance. Within the same building are included complete ranges of apartments for recreation, cards, and taking refreshments ; one set for the nobility and another set for the *bourgeoisie*. Ample stair-cases conduct to every part, and every accommodation

modation is furnished for rendering this place fit for assemblies upon all occasions.

The theatre, like that of Naples, is considerably too large: the actor is heard with great difficulty, though better than at Naples, which I think is owing to the judicious manner of fitting it up. The whole of the internal part is of wood; the parapets of the box-fronts are maintained of a good height, and are perfectly plain and even. The enclosures which divide the boxes recede a small distance from the front, which is the method I would prefer to that of projecting the fronts in curved lines, as it would give a very superior advantage with respect to both sight and sound.

In this theatre we may learn what is the effect of sound with the greatest aids it can receive in its progress: and with all these assistants we find that this space is considerably too large, and that a certain dimension ought not to be exceeded. In proportion to its width this theatre will be found to be too long by 21 feet, agreeably to the form in which the voice expands.

*Of the Theatre at Turin. Pl. 6. Fig. 3.*

**T**HIS theatre is attached to the king of Sardinia's palace, and has the stage-floor nearly level with his apartments. The form is an oval cut off at one end and spread at the stage-opening.

The length from the stage to the front of the opposite boxes is 61 feet, the breadth 52. The height is 53 feet from the floor of the pit to the highest part of the ceiling; which latter rises about 5 feet, making in it's breadth the portion of a circle whose centre is nearly in the middle of the pit. It is composed of boards perfectly smooth, lined with cloth, and ornamented with paintings in oil: a void is managed above on the principle of musical instruments. There are 6 ranges of boxes, at the average of 29 in every range; each box is 6 feet wide and 6 feet 11 inches high: the king's box is placed in front of the scene, nearly on a level with the stage.

Under the orchestra there is a reversed arch, with a pipe at each extremity, terminating and opening underneath the stage.

The frontispiece is highly ornamented with 4 massy columns, with boxes between them, and in the centre is the aperture, by which they let down a large chandelier before and after the performance, contrary to the practice in these countries, where it is usually suspended in the middle of the ceiling. The stage advances in a circular line; the  
L opening

opening is 42 feet 6 inches wide, and it is 112 feet long, besides a court behind, by which they occasionally lengthen the scenery.

This theatre is conveniently approached by spacious porticos, of which there are three; one for foot passengers and chairs, another for the passage of carriages, and the third for carriages in waiting: these lead to many ample stair-cases, &c.

I have been particular in describing the different parts, because no pains were spared to render this the most perfect edifice of its kind by the Count Alfieri.

The observation I made was in the pit, and I found that, similar to others, the voice was heard proportionably better at the sides than at the end fronting the stage. At Turin it is generally said to be too large, that is, too long; for we hear remarkably well at the sides as we approach the stage; and the length will be found to be 19 feet too much in proportion to its breadth. Great pains were taken to assist the sound by the form and material; but they have failed in the form, and it was injudicious to paint the ceiling on a lining of cloth.

*Of the Theatre at Bourdeaux. Pl. 6. Fig. 4.*

**A**LL persons acquainted with the theatre at Bourdeaux, are unanimous in their decision in it's favour. They all agree that the voice of the actor spreads more equally in this than in any other theatre. The figure, reckoning at the front of the amphitheatre, is nearly equal to it's whole circle; but the wall is cut off, at about one fifth of the diameter for the stage-opening. It is decorated with 12 columns of the whole height from the amphitheatre to the arches under the ceiling, between which the upper ranges of boxes are managed. It's great diameter is 64 feet, and between the boxes it is 53 feet wide; from the stage-front to the opposite boxes, 47 feet. The stage-opening is about 40 feet. Great care has been had to use none but the most beneficial materials for the inside: the ceiling is painted in fresco, and the whole most elegantly adorned.

The smallness of it's size is much in it's favour, which renders it difficult to make a comparison. The form is regulated thus. Within the greater circle a square is inscribed, three sides of which are given to the theatre, and the fourth is left open for the stage. My plan would bring forward the stage nearly as far as the line dividing the orchestra and pit, thereby avoiding those side boxes which incline their backs towards the stage. The almost insulated columns are bad; and the



disjoining of the boxes by them, and placing of so many arches at the top, takes away much of the acknowledged benefit of smooth and unbroken surfaces.

*Of the Théâtre Italien at Paris. Pl. 9. Fig. 1.*

THE form of this theatre is three fourths of an oval: it is 58 feet long from the stage-front to the opposite wall, and 48 feet wide between the walls.

If the architect meant to follow Monsieur Patte's principle, he has adopted the worst part in choosing this form, and has neglected in every other instance the good advice that author gives. He has separated the boxes by the most ill-formed partitions, which projecting a little from the wall are so many checks to the sound. This theatre is universally condemned, and is a disgrace to that polished nation.

I need not here repeat my arguments respecting the too great length of the theatre; but shall leave them to be applied by those who have the least acquaintance with this building.

*Of the Théâtre François, now de la Nation, at Paris. Pl. 9. Fig. 2.*

**T**HIS building is insulated, but communicates by two bridges with houses on either side. It is surrounded on three sides by open spacious corridors and a portico of eight columns in front. The plan shews one half of the theatre taken at the height of the first floor of the boxes and balcony, all the rest at the level of the pit-floor.

The theatre (or salle) within the walls is 64 feet wide, 58 feet 6 inches long from the front of the stage-floor, and 52 feet high from the floor of the pit to the centre of the ceiling. The stage-opening is 42 feet 6 inches wide. The form is that of two semicircles whose diameters are opposed to each other at the distance of 6 feet; the intermediate space being bounded at each end by a straight line. The stage-floor advances into the theatre, in a curved line, to the distance of about 11 feet from the end of the semicircle nearest the scene. There are four ranges of boxes, exclusive of those in the arches; part of the upper range is occupied by the gallery; and a little above the level of the stage a balcony projects over the pit. From the first floor of the boxes 12 pilasters rise to the whole height, supporting a domed ceiling, which is intersected by groined arches.

This theatre is held in great estimation for the equal force with which the voice reaches every part of it; and had it been executed agreeably

to the original plan \*, I do not hesitate to say it would have been still nearer perfection. Although it is faulty in many respects, yet the advantages resulting from it's proximity to the form, in which the voice expands, particularly deserve our attention.

According to the experiments on Prop. I. Chap. II. this theatre is about 9 feet 120 long in proportion to it's width ; which I believe will be found to be the case upon an accurate observation in the theatre. The advantages it possesses can arise only from the direct force of the voice, for in almost every other instance it is far from aiding the voice : for example, the pilasters project considerably before the walls, there are many arches in the ceiling, a balcony projects over the pit, and a range of enclosed boxes surround the same.

\* The original design, as projected by Mess. de Wailly & Peyre, architects du Roi, was a circle into which the stage advanced nearly one third of the diameter.

*Of the late Opera House in London. Pl. 10. Fig. 1.*

**S**IR John Vanbrugh had interest enough to raise a subscription of thirty persons of quality, at 100*l.* each, for building a stately theatre in the Haymarket: on the first stone that was laid of this theatre were inscribed the words *Little Whig*, as a compliment to a celebrated beauty, the toast and pride of that party. The house being finished in 1706, it was put by Mr. Betterton and his associates under the management of Sir John Vanbrugh and Mr. Congreve, in hopes of retrieving their desperate fortunes; but their expectations were too sanguine. The prospects of the theatre being unpromising, Mr. Congreve gave up his share and interest wholly to Vanbrugh\*.”

This theatre underwent several alterations †, the principal of which

\* See Biographical Dictionary, ed. 1784, art. Vanbrugh.

† “At the first opening it, the flat ceiling that is now over the orchestra, was then a semi-oval arch, that sprung fifteen feet higher from above the cornice. The ceiling over the pit too was still more raised, being one level line from the highest back part of the upper gallery to the front of the stage; the front boxes were a continued semicircle to the bare walls of the house on each side. This extraordinary and superfluous space occasioned such an undulation from the voice of every actor, that generally what they said sounded like the gabbling of so many people in the lofty aisles in a cathedral. The tone of a trumpet, or the swell of an eunuch's holding note, 'tis true, might be sweetened by it; but the articulate sounds of a speaking voice were drowned by the hollow reverberations of one word under another.” Cibber's Apology.

was in 1782, when it was enlarged under the direction of Mr. Novosielski. The form was then made an oblong rounded off at the end opposite the stage. The length was, from the stage-front to the opposite boxes, about 58 feet, and 23 feet more to the scene; the breadth between the boxes 43 feet; and the height 44 feet from the centre of the pit to the ceiling. There were three ranges of boxes, 34 in each range, besides 18 in a line with the gallery; in all 116, allowing the space of two for entrances into the pit. Each box was from 5 to 6 feet wide, from 7 to 7 feet 6 inches high, and 6 feet deep. Those in the first range being on a level with the stage, had their fronts continued in one even line to the central box; but all the ranges above, as also the first gallery, projected in curved lines over the pit. A second gallery was managed in the cove of the ceiling, which was groined for that purpose. Five entrances led into the theatre; three from the Haymarket, and two from Market-lane.

Being confined to the original walls, Mr. Novosielski had not the opportunity of giving it a greater width; the form therefore remained extremely bad, and the stage and its appendages wretchedly confined and inconvenient. But I will desist from particularising these defects which were unavoidable, and speak of such as in my opinion might have been avoided.

The only assistance sound can have to reach the end of a long, confined space, is plain and smooth surfaces to conduct it: instead of which, the line of the box-fronts in this theatre was continually broken by the projecting curves, and these covered with paper ornaments, which were

liberally

liberally distributed in every part of the theatre. The first gallery was low and inconvenient, and very little could be either discerned or heard there by those who were situated behind. The second gallery by being next to the ceiling was the best situation in the house for hearing, but very prejudicial to every other part. And thus that which was of necessity bad was rendered still worse, by adopting almost every means in the finishings, that could oppose the progress of sound.

*Of the Theatre in Covent Garden. Pl: 10.*

Fig. 2. is the plan taken at the level of the front boxes.

Fig. 3. the plan at the level of the first gallery.

**T**HIS theatre is 86 feet long from the stage-opening to the opposite wall at the end of the gallery, and 56 feet wide between the walls; 31 feet 6 inches high from the stage-floor to the ceiling, which slopes upwards to make room for the upper gallery. The form of the area between the box and gallery fronts is an oblong, 36 feet 6 inches from the front of the stage-floor, and 56 feet from the scene to the opposite boxes, and 38 feet 6 inches wide between the boxes. The front boxes are 18 feet deep from the front to the back, the first gallery 30 feet 6 inches, and the second gallery 21 feet 6 inches. I will first take notice of the inconveniences theatres are subjected to, when built of this form, and then examine the present one in particular.

If the form of a square be ill adapted for viewing, as represented on pl. fig. 11. the sides of an oblong must be proportionably worse: it is impossible to view the actor from the distant end of the side boxes without great pain, and even then he must be seen very imperfectly, and those seated behind cannot see at all. But the distance occasioned by this form is not the only defect; a considerable one arises from the great depth of the front boxes and two galleries over them. The fronts being low, necessarily obstruct the sound: the little that enters is presently attracted and absorbed by the persons, clothes, &c. of the spectators in the foremost rows\*; the continual respiration of so great a concourse of people in this confined situation, together with the lights, soon renders the air unfit for the purpose of conveying sound; the air losing it's elastic property becomes extremely unwholesome, and any remedy applied to those particular parts by the partial introduction of cold air, would be productive of bad consequences. If it be necessary to have apertures to renew the air, they should be general; or where one only is used it ought to be situated so as equally to affect the whole theatre.

Persons of rank and private parties are obliged to resort to the side boxes in order to avoid being incommoded by the much complained of admission of all characters into the front boxes; but here they lose the advantage of sight, besides being obliged to a distortion of the body in turning towards the actor; or if, to avoid these inconveniences, they

\* This observation I have often made in the first gallery, where the difference of hearing before the upper gallery and under it was very apparent.

make choice of the stage-box, the line of lamps before their eyes is equally offensive. I believe it is universally agreed that the pit is the only good situation in our present theatres.

Covent Garden theatre has been built about 60 years; during which time it has not undergone any material alteration, except in the decorations, till the year 1784, when it was judiciously widened under the direction of Mr. Richards, who was confined to the present walls, and therefore could not extend it as he wished. This therefore with respect to it's form remains with all the defects usual in English theatres.

Mr. Richards would have acted judiciously had he introduced more painted ornaments in lieu of projecting ones, which as a scene-painter I am rather surprised he did not. For example, the parapets of the gallery-fronts and upper boxes, which afforded opportunities for plain surfaces, are filled in with solid balusters; the others are divided into panels and tablets, with carved ornaments in the friezes; pilasters are placed at the sides of the gallery without the least apparent necessity, and the like all round the lower range of boxes, with decorative arches over; and all the partitions are lined with paper, and festoons of drapery hang in front\*; than which nothing can be more injurious to the progress of sound.

The public should not submit to be crowded into such narrow seats: 1 foot 9 inches is the whole space here allowed for seat and void;

\* This I imagine to have been done to hide an architectural defect, the floor of the upper ranges being below the architrave of the under range.



though a moderate-sized person cannot conveniently sit in a less space than that of 1 foot 10 inches from back to front, nor comfortably in less than that of 2 feet.

The frontispiece is such an one as no architect would have applied. Were a painted frame to be proposed for a picture, how would a connoisseur exclaim ! The scene is the picture, and the frontispiece, or in other words the frame, should contrast the picture, and thereby add to the illusion. The great advance of the stage-floor was made with a view to obviate the great difficulty of hearing in this theatre ; but the little service of such remedies I trust is sufficiently demonstrated in Chap. IV. The stage is very much confined, and therefore subjected to those inconveniences so ably set forth by Monsieur Noverre in his " *Observations sur la Construction d'une nouvelle Salle de l'Opera.*"

The original form of this theatre was similar to the present theatre in Drury-lane, and is represented by the dotted lines, fig. 3.

## CHAPTER VII.

*Description of a Design for a Theatre. Pl. 11 and 12.*

PLATE 11 represents the plans—fig. 1 at the level of the stage-floor—fig. 2 the principal entrance; being under the coffee-room.

Plate 12 contains two sections—fig. 1 from *a* to *b*, fig. 2 from *c* to *d* on the plan.

These designs exhibit only the internal parts of the theatre, being confined to the principles of construction, distribution, and accommodation. The decorations are purposely avoided in order to preserve our attention entire to the other objects. The external parts must always be made applicable to the situation.

Agreeable to the principle laid down in Chap. II and III. *that the direct force of the voice only can be depended on in a theatre*, this is planned upon the exact form in which the voice expands. The diameter within the line of the covered boxes is 60 feet; the distance from the stage-floor to the opposite central box is 45 feet: therefore 30 feet being the radius or semidiameter, 15 feet are left for the additional force of the voice in a right line from the stage-front; and as 17 feet is proved to be the proportioned distance for throwing the voice into a semicircle, this plan leaves 2 feet upon the stage which is generally the actor's situation, as at *x*. The height from the stage-floor to the ceiling is 45 feet, and

the gallery being below it and receding from the stage, brings all the spectators in front within an angle of 36 degrees. In this plan very few can be said to be seated sideways to the stage; all within the semi-circle, which contains full four fifths of the company, are seated in front, besides those in the pit.

To obviate the objection that our boxes in general are not desirable situations for hearing, a balcony is here projected before the boxes, possessing more advantages than will be found in the pit, being more elevated and still near to the actor; so that the whole of the audience would be within a very moderate distance of hearing, and throughout the advantages are nearly equal. The first gallery projects only 8 feet over the boxes, and the upper gallery but 9 feet over the other. Thus the evil of confined and deep cavities is prevented, and a free circulation of air must be the consequence, which is so very necessary to the conveyance of sound and regard for health.

This plan affords an opportunity of placing the orchestra in a central situation, and thereby preventing the predominancy of some instruments above others, and rendering the music more united and harmonious. Under the orchestra a reversed arch is managed, in a method similar to the Italian.

The stage-opening is 38 feet 6 inches wide; the front of the stage-floor is preserved straight, which together with the frontispiece projects 7 feet 6 inches before the scene. The actor will consequently have very little advance to make, and will appear (as he certainly should do) among the scenery.

An advantage this form possesses over every other, respecting the number of spectators it will contain, I shall prove by comparing it with Covent Garden theatre. In this, designed theatre every spectator would be well accommodated, and the different ranges of boxes and galleries maintained of a spacious height. A person seated in the most remote part from the scene, would be 15 feet nearer the scene than a person so situated in Covent Garden theatre \*. And yet,

In Covent Garden theatre,,			In the designed theatre,		
The upper gallery will contain	384	persons	-	-	525
First gallery and slips	-	-	700	-	-
					927.
Boxes	-	-	729	-	-
					600
Pit	-	-	357	-	-
					368

And were the number of seats in this design increased by reducing their width from 2 feet to 1 foot 9 inches, which is the size of those in Covent Garden theatre, this would afford room for exceeding the nightly receipts of that house by 40 pounds.

The present design exhibits a form the most analogous to the *amigue* that it is possible for our arrangements to permit †: a spectator seated in any part of this theatre would have the additional gratification of

\* That the comparison should be taken from the front of the scene, I think is sufficiently demonstrated in Chap. IV. See "Frontispiece."

† By inscribing a triangle within the circle which the boxes describe we shall find that one side will be the line of the stage-floor, answering to the Roman scene: or by inscribing a square within the same circle, our scene will be found nearly answering to the Greek. The difference on the plan is that our seats are continued beyond the semicircle

seeing the greater part of the company arranged in the most beautiful line; a line which the ancients constantly maintained in their theatres.

A happy opportunity here offers for placing the king's box opposite the stage, which projecting to the front of the balcony, with a small canopy over it, would be within view of nearly all the spectators; and the royal persons would enjoy the exhibition in it's perfection, being situated at a point which unites the illusion of the scenery with the advantage of hearing; a desirable circumstance, which in this country has never yet been attained.

The entrances into the pit will be by two doors at the corners marked *y, y*: the dotted lines shew the passages between the seats.

Each box will have it's separate door communicating with an arched corridore, and four doors lead into the balcony, which together with three large outer doors will render the departure, in case of an alarm, safe, easy and expeditibus.

The spaces marked *H, H*, will each contain two spacious staircases, which being of stone and encircled by a wall will ensure the safety of spectators in the galleries.

The staircases *F, F*, leading from the principal entrance will communicate with the theatre and coffee-room *G*, which is by this means situated at a convenient distance, so that the audience may not be disturbed by those who frequent that place.

*K* is a waiting room for the convenience of those who attend the arrival of their carriages; and by it's vicinity to the hall of entrance *M*,

is

is rendered very convenient for giving directions to the servants there in waiting.

L is the receiver's room. The paying-door being at the beginning of the passage I, will enable the door-keeper to prevent improper persons from crowding the passages\*.

The stage comes near the proportion desired by Monsieur Noverre, and which perhaps he would allow to be sufficient for our theatre. Following his advice I have planned a depository at each side P, P, communicating with the stage by three arches, for the convenience of shifting the scenes and machinery; and ample room will be left for forming the bodies of choruses, dancers, attendants, &c. The scene may occasionally be lengthened by having a shifting partition to divide the green room and stage.

R, R, are dressing rooms for women, four stories high above the stage; S, S, the like for men; in all sixteen, communicating by the staircases T, T, with the green room Q and the wardrobe over it; making two stories above the stage. The wardrobe by being thus situated will be in the centre of the dressing rooms, and the clothes may be served to the different persons without carrying them about to an inconvenient distance.

\* The long passages which conduct to the different parts of our present theatres are productive of much mischief. The paying-doors, instead of being at the outward end, are always in the contrary situation; thereby giving the best of opportunities for the depredations of pickpockets, and confining the company in a narrow space without the possibility of relief in case of an accident.

Underneath the stage, &c. may be contrived the housekeeper's apartments, performers' entrance, carpenter's shop, painter's room, &c. &c.

*Description of a Design for an Opera House. Pl. 13.*

**F**IG. 1, represents the plan. Fig. 2, a section of the theatre from *a* to *b* on the plan. Fig. 3, ditto from *c* to *d*.

These designs are confined to the theatre and stage, being the principal subjects of this treatise. Respecting the form, &c. what has already been said upon the foregoing design for a theatre will equally well apply to this for an opera.

This design is for a very small opera house. The diameter between the boxes is 68 feet; the distance from the front of the stage-floor to the opposite boxes 51 feet; and the height is 51 feet from the stage-floor to the ceiling. The stage-opening is 43 feet wide, and the floor advances 8 feet 6 inches before the scene. There are four ranges of boxes, 25 in each range; each 6 feet wide, 7 feet 6 inches high, and 8 feet deep; in all 98, allowing the space of two for the entrances into the pit. One gallery only is here proposed, which, by being spacious and open, would be a desirable situation; and the ceiling being perfectly even, will assist the voice in reaching those distant parts. Each box has its separate door communicating with arched corridors

### *Description of a Design for an Opera House.*

31

8 feet wide, leading to spacious stone staircases; and the pit will have four entrances—two leading to the corridors, and one on each side of the orchestra. The two circular staircases in the angles are for the gallery.

The divisions between the different ranges of boxes, together with the parapets, are contrived without breaks, and the surfaces as wide as can be obtained. The gallery is entirely open, and, as I conceive, more characteristic; for a ceiling, or roof, in appearance supported by slender pillars, resting one upon another to the number of 6 or 8 in height, is a very uncomely sight.

If this plan be extended to the largest size we ought in reason to allow, namely to 60 feet from the stage-floor, and 70 feet from the scene to the opposite boxes, and these continued to the scene according to the usual mode, it will contain 165 boxes, for 6 persons each, in all 990; and the pit will contain 900 persons, the gallery 927.

I cannot too much enforce what has already been said respecting the distance for hearing. In most of the theatres extant, whoever wishes to have a tolerable view of the stage, must be situated beyond the reach of the actor's voice; but if he wishes to be near the stage, he is miserably seated sideways: such is the usual compensation for an excessive subscription. I am confident, that where the distance of 60 feet from the front of the stage-floor, or 70 feet from the scene to the opposite boxes, is exceeded, the actor will be heard very imperfectly;—but not to rest on my bare assertion, I beg leave here to sum up the several evidences.



The theatre of Argentinia at Rome is 55 feet long from the stage-floor, and 63 feet from the scene to the opposite boxes. The théâtre François, now de la Nation, at Paris, is 54 feet long from the stage-floor, and 63½ feet from the scene to the opposite boxes; in both which the actor is well heard. On the contrary, the théâtre Italien at Paris is 58 feet from the stage-floor, and 74 feet from the scene to the opposite boxes; the theatre at Turin is 56 feet from the stage-floor, and 75 feet from the scene to the opposite boxes; and more than either is the theatre of San Carlo at Naples, being 64 feet from the stage-floor, and 78 feet from the scene to the opposite boxes; a size this so excessive, that it is with the greatest difficulty the audience can distinguish any thing said upon the stage; and the other two are proportionably bad.

C O N C L U S I O N.

**A**MONG the various designs I had projected for theatres I conceived the two here offered to the public to be the best, as combining the greatest advantages, and uniting the interest of the manager with that of the public. Many obstacles, it is true, oppose the forming of a perfect work; but we should carefully distinguish between the greater and less imperfections; and it is particularly the province of the architect to make the former subservient to the latter.

I cannot help repeating what I before observed, that it is in our power to have a theatre superior to any existing; but I despair of seeing a magnificent one erected till undertaken by a company of persons of rank and fashion, whose influence and example would soon produce a sum more than equal to its charges. Late instances testify the avidity with which subscriptions are entered into, although the speculations of private individuals. Many schemes might be proposed for this purpose; but that which appears to me the readiest and most feasible, is to divide the property into a number of shares; each share to be entitled to a box in perpetuity. Suppose for example the theatre to contain 165 boxes, and 65 to be the number of proprietors; a subscription of 1500 l. each would produce 97,500 l. and each proprietor by holding a box would possess equal to an annual interest of 126 l. for the 1500 l. The proprietors would have it in their power to choose a fit person for the  
manager,

manager, to whom the theatre might be let for short terms at a pepper-corn rent ; the manager to keep it in repair and produce a stated number of exhibitions, for which there would remain the receipts for 100 boxes to be let to yearly subscribers, and the receipts for admission into the pit and gallery, which at a moderate computation would amount to 40,000*l.* annually \*, besides other contingent advantages ; a sum that would command the most magnificent representations.

\* The yearly expenditure has been usually confined to 18,000*l.*

T H E E N D.







